Virtual health coaching for consumers: a persuasive systems design perspective

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Abstract: The lifestyle that people adopt has a direct impact on their health and well-being. On a global scale, lifestyle-related non-communicable chronic diseases (such as cardiovascular disease, diabetes and some forms of cancer) continue to increase and have become the leading causes of mortality. In recent years, there have been calls to action regarding the global burden of lifestyle-related non-communicable diseases. There is a demand for IT applications and systems that allow individuals to manage their health and well-being and potentially alter their health-related behaviours. Persuasive technology has the potential to be in the forefront of novel health-related prevention services. Persuasive technologies are designed to induce and influence people to change their attitudes and behaviours. Behaviour change support systems (BCSSs) are at the heart of persuasive technology research and practice. The objective of this study is to investigate consumers’ perceptions of an instantiation of a BCSS, called virtual health check and coaching, which is a non-clinical web-based system for personal lifestyle and health management. In the present study, we examine the consumers’ insights through the persuasive systems design model. Implications for persuasive systems design are discussed.

Keywords: behaviour change support systems; BCSSs; consumer; eHealth; persuasive systems design; PSD; virtual health check; coaching.


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This paper is a revised and expanded version of a paper entitled ‘Virtual health check and coaching: insights from the consumers and implications for persuasive design’ presented at the Proceedings of the 4th International Conference on Well-Being in the Information Society, WIS 2012, Turku, Finland, August 2012.

1 Introduction

Lifestyle-related non-communicable chronic diseases (such as cardiovascular disease, diabetes and some forms of cancer) continue to increase on a global scale and have become the leading causes of mortality. World Health Organization’s (WHO, 2008) estimates of mortality and global burden of disease forecast that by the year 2030, more than three quarters (77%) of all deaths in the world will be because of such diseases. Evidently, the lifestyle that people adopt directly influences their health and wellbeing. Eight risk factors (alcohol use, tobacco use, high blood pressure, high body mass index, high cholesterol, high blood glucose, low fruit and vegetable intake, and low physical activity) account for 61% of cardiovascular deaths (WHO, 2008). These same risk factors combined account for over three quarters of ischemic heart disease (IHD), which is the principal cause of mortality. The eight risk factors are commonly associated with economically wealthy countries, but over four-fifths (84%) of the total global burden of disease they cause eventuates in low- and middle-income countries (WHO, 2008). It is pivotal to note that the aforementioned risk factors are preventable to a great extent (e.g., Strong et al., 2005).

In recent years, there have been calls to action regarding the global burden of lifestyle-related diseases. The above discussion highlights the need to design, implement, and evaluate novel solutions that allow people to manage and/or change their lifestyles, and address their health conditions. Persuasive technology (Fogg, 2003) has the potential to be in the forefront of novel health-related prevention services (Chatterjee and Price,
applications and products. Moreover, a focal aspect is persuasive systems design (PSD) (Oinas-Kukkonen and Harjumaa, 2009); persuasive systems, in essence, influence users’ behaviours and perceptions, and various strategies may be applied by these technologies to support different outcomes and behaviour change strategies (Oinas-Kukkonen and Harjumaa, 2009; Berkovsky et al., 2012).

The objective of this study is to investigate consumers’ perceptions of virtual health check and coaching, which is a non-clinical web-based system for personal lifestyle and health management. Specifically, we examine the consumers’ insights using the PSD model (Oinas-Kukkonen and Harjumaa, 2009) as a lens. The remainder of the paper is organised as follows. Section 2 presents related research. Section 3 discusses the research setting. Findings are presented in Section 4. Section 5 is for discussion and Section 6 concludes the paper.

2 Background and related research

2.1 Persuasive technologies in the eHealth domain

Payton et al. (2011, p.vi) suggest that there has been “a shift in the role of the patient from passive recipient to active consumer of health information and active user of healthcare devices, logging, and monitoring systems”. Indeed, by providing consumers with access and tools to their own health information, we can begin to influence how they manage their health and well-being. Ultimately, consumer health IT applications and systems enable individuals to manage their health better and maintain a healthier lifestyle. Examples of consumer health IT include various technologies, such as web- and mobile-based applications and social health technologies, and portable devices, such as accelerometers and sensors.

More than a decade ago, Eysenbach (2000) stated that the major challenge in developing comprehensive health information systems for consumers is that there is limited knowledge of how people interact with consumer health informatics and how they process and act on information. Even now, several years later the argument made by Eysenbach seems to be valid. In a more recent report by Jimison et al. (2008) the most common barrier to consumer use of interactive health IT across studies was the lack of perceived benefit; lack of convenience was another important obstacle. Also, participants were less likely to use systems if they did not fit seamlessly into their regular daily routines. Other significant obstacles to the use of the interactive consumer health IT were burdensome data entry and the lack of trust in the information (Jimison et al., 2008). Unsurprisingly, technical issues often averted consistent system use. Clearly, technologies cannot have the capacity to help facilitate self-monitoring and self-management or improve consumers’ health outcomes if the consumers do not accept the technology.

Research on persuasive technology (Fogg, 2003) has been introduced relatively recently. There are numerous definitions of persuasion. According to Bostrom (1983, p.8), persuasion is “the name we give to the type of communication that brings about change in people” while Simons (2001, p.7) states that persuasion is “human communication designed to influence the autonomous judgments and actions of others”. Successful persuasion takes place when the target of change (e.g., attitudes, beliefs) is modified into the desired direction (Briñol et al., 2007). Persuasive technologies
influence users’ behaviours and perceptions, and various strategies may be applied by these technologies to support different outcomes and behaviour change strategies (Berkovsky et al., 2012, Oinas-Kukkonen, 2013). Persuasive technologies are employed in a variety of domains, for instance, e-commerce (Kaptein and Eckles, 2012), education (Forget et al., 2008), health (Chatterjee and Price, 2009), safety (Chittaro, 2012), and sustainability (Jenkin et al., 2011).

Persuasive technology has demonstrated great potential in contemporary health-related prevention services, applications and products (Chatterjee and Price, 2009). The use of technologies to persuade, motivate and activate individuals’ for health behaviour change has been a quickly expanding field of research. Also, the popularity of the internet as a channel to disseminate and access health-related information is increasing (e.g., Lemire et al., 2008). Using the web as a delivery channel for health behaviour change interventions has been especially relevant. It is commonly acknowledged that web-based automated health behaviour change interventions have the potential of high reach and low cost. Various web-based interventions for preventing, assessing, and treating a variety of conditions such as alcohol problems, depression, diabetes, obesity, physical inactivity, and smoking have been tested in numerous controlled trials. Extant comprehensive meta-analyses provide support for their effectiveness in increasing users’ knowledge and awareness and changing their attitudes and behaviour in the health promotion area (e.g., Webb et al., 2010). However, one of the largest challenge in web-based interventions is that participant attrition is generally very high, and among those participants who are retained, engagement rates usually decline remarkably over time (e.g., Eysenbach, 2005).

As reducing attrition and increasing website utilisation would likely increase intervention success, designing, implementing, and evaluating features that participants find attractive and captivating should be prioritised. Sillence et al. (2006) suggest that design issues are not only superficial, they should rather be regarded “as an important feature with real implications”. The authors continue by stating: “If people cannot move beyond the poor design then the quality of the content becomes irrelevant”. Hardiker and Grant (2011, p.10) emphasise that “there should be continued focus on appropriate design and content of eHealth services. Services should aim to provide understandable, relevant and trustworthy content to a wide variety of potential users and in a way that is straightforward to use and that fits with day-to-day life”.

Consolvo et al. (2009) outline a set of design strategies for technologies motivating lifestyle behaviour change. They propose eight design strategies:

1. abstract and reflective
2. unobtrusive
3. public
4. aesthetic
5. positive
6. controllable
7. trending/historical
8. comprehensive.
Consolvo et al. (2009) suggest using theory and findings from recent persuasive technology research to extend existing design goals. Brewer and Rimer (2008) note that disappointing outcomes for some health behaviour change interventions should urge to consider the use of persuasion strategies. Webb et al. (2010) suggest that the effectiveness of internet-based interventions is associated with

1. more extensive use of theory
2. inclusion of more behaviour change techniques
3. use of additional delivery modes.

van Gemert-Pijnen et al. (2011) have proposed a holistic framework for the design and development of eHealth technologies. According to the authors, the framework serves as an evidence-based roadmap toward the development and eventual integration of the eHealth technologies in the health sector. Within the roadmap, utilising persuasive strategies is mentioned as one of the six key issues.

2.2 Behaviour change support systems

Regarding consumer health IT, Oinas-Kukkonen (2010, 2013) has proposed a related generic concept: behaviour change support systems (BCSSs). Oinas-Kukkonen (2013) has defined a BCSS as follows (p.1228):

A behavior change support system (BCSS) is a socio-technical information system with psychological and behavioral outcomes designed to form, alter or reinforce attitudes, behaviors or an act of complying without using coercion or deception.

BCSSs highlight autogenous and voluntary approaches in which people use information technologies to change their own attitudes or behaviours through building upon their own motivation or goals (Oinas-Kukkonen, 2013). BCSSs harness either technology-mediated persuasion or technology-to-individual persuasion. Technology-to-individual persuasion is fully automatized, whereas technology-mediated persuasion means that people are influencing other people through, e.g., discussion forums, instant messages, blogs, virtual environments, or social network systems. The design and development of BCSSs consists of many different and connected parts. According to Oinas-Kukkonen (2013), it links to technological services, applications, systems, platforms, and functionality, the quality and content of information, and social networks/environments, among other issues; generally, the BCSSs must be always available, they have to address global and cultural issues with a multitude of standards, habits, and beliefs; furthermore, they have to be adaptable into a variety of domains (e.g., healthcare, safety, energy conservation, education) and business models. The system under investigation, virtual health check and coaching, can be seen as an instantiation of a BCSS. Table 1 presents an overview of related concept found in the literature.
Table 1  Concepts related to BCSSs

<table>
<thead>
<tr>
<th>Authors</th>
<th>Concept</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barak et al. (2009)</td>
<td>Web-based intervention</td>
<td>“A primarily self-guided intervention program that is executed by means of a prescriptive online program operated through a website and used by consumers seeking health- and mental-health related assistance. The intervention program itself attempts to create positive change and or improve/enhance knowledge, awareness, and understanding via the provision of sound health-related material and use of interactive web-based components.”</td>
</tr>
<tr>
<td>Eysenbach (2000)</td>
<td>Consumer health informatics</td>
<td>“Consumer health informatics is the branch of medical informatics that analyses consumers’ needs for information; studies and implements methods of making information accessible to consumers; and models and integrates consumers’ preferences into medical information systems.”</td>
</tr>
<tr>
<td>Gustafson et al. (2002)</td>
<td>Consumer health informatics systems (CHIS)</td>
<td>“Consumer health informatics systems (CHIS) include patient-oriented interactive computer-based programs that provide information, decision, behavior change and emotional support for health issues. […] CHIS services can range from simple applications such as a single article or discussion group to ones offering many services including information, communication, analysis, personalized web pages and computer based games designed to promote behavior change.”</td>
</tr>
<tr>
<td>Murray et al. (2005)</td>
<td>Interactive health communication applications (IHCAs)</td>
<td>“Interactive health communication applications (IHCAs) are computer-based, usually web-based, information packages for patients that combine health information with at least one of social support, decision support, or behaviour change support.”</td>
</tr>
<tr>
<td>Or and Karsh (2009)</td>
<td>Consumer health information technology (CHIT)</td>
<td>“CHITs are defined as computer-based systems that are designed to facilitate information access and exchange, enhance decision making, provide social and emotional support, and help behavior changes that promote health and well-being.”</td>
</tr>
</tbody>
</table>

3  Research setting

3.1  Description of the BCSS under investigation

Virtual health check and coaching has been developed by Duodecim Medical Publications Ltd. The BCSS in question is based on the best available information regarding health enhancing lifestyle, and the impact of lifestyle on quality of life and life expectancy and also the possibilities of changing to healthier habits. The estimates for life expectancy and disease risks are based on several studies conducted by the National Institute of Health and Welfare and the Social Insurance Institution of Finland.
Modifiable life style factors taken into account include nutrition, physical exercise, alcohol use, smoking, sleep, mental stress, and life skills. In addition, respondent’s blood pressure, blood cholesterol value and parents’ IHD morbidity are included in the estimation algorithms.

Due to a lack of reliable information, it is not possible to consider the effects of certain health-related factors in the estimation. Examples of these factors are: high usage of salt; hard fats from meat products; drug abuse; risk-prone extreme hobbies; and risky sexual behaviour. In addition, chronic diseases, except for diabetes, are not taken into account in the virtual health check. It is important to note that the programme is not meant to be used to diagnose a disease or to predict falling ill with particular disease, but its estimates are statistical averages for a given age and gender group with a defined health behaviour pattern. The advice given by the programme is meant to support individual’s health and well-being. Individuals who are concerned about their health and/or well-being are encouraged to consult a doctor.

After completion of the virtual health check, the individual starts using (activates) the virtual health coaching. A partial screenshot of the web interface is presented in Figure 1.

**Figure 1** A partial screenshot from the web interface of the virtual health coaching (see online version for colours)

The virtual health coaching provides personalised exercises, suggestions and feedback on a regular basis via e-mail and web interface. The main (user selectable) topics of the
coaching programme are: alcohol use, physical exercise, mental well-being, nutrition, sleep, smoking. Coaching programmes are based on evidence-based cognitive behavioural exercises.

3.2 Data collection and respondent characteristics

In November 2011, an online survey was conducted for the users of the virtual health check and coaching. Participants were recruited through an e-mail invitation to the survey. Data was collected over a period of seven days using an online survey software tool (Webropol). The survey instrument consisted of demographic questions, five-point Likert scale items, and open-ended questions. The respondents were amongst the group of people who were previously contacted by Duodecim Medical Publications Ltd. and asked to voluntarily ‘test drive’ the system. Thus, the sample is based on convenience. Overall, 130 responses were obtained. Out of these respondents, 91 had activated the virtual health coaching. In this study, we concentrate primarily on these respondents. Their characteristics are presented in Table 2.

Table 2  Respondent characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>53 (58.2)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>38 (41.8)</td>
</tr>
<tr>
<td>Age</td>
<td>Mean age 43.4 (± 9.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Range 19–71 years</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>Basic education</td>
<td>2 (2.2)</td>
</tr>
<tr>
<td></td>
<td>Upper secondary education</td>
<td>15 (16.5)</td>
</tr>
<tr>
<td></td>
<td>Specialist vocational qualification</td>
<td>9 (9.9)</td>
</tr>
<tr>
<td></td>
<td>Polytechnic bachelor’s degree</td>
<td>24 (26.4)</td>
</tr>
<tr>
<td></td>
<td>Polytechnic master’s degree</td>
<td>6 (6.6)</td>
</tr>
<tr>
<td></td>
<td>University bachelor’s degree</td>
<td>4 (4.4)</td>
</tr>
<tr>
<td></td>
<td>University master’s degree</td>
<td>28 (30.8)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Employed</td>
<td>80 (87.9)</td>
</tr>
<tr>
<td></td>
<td>Retired</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td></td>
<td>Student</td>
<td>3 (3.3)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>5 (5.5)</td>
</tr>
</tbody>
</table>

Majority of the respondents are ‘white collar’ workers as most of them were working (87.9%) and had a university degree (35.2%). Only 6.6% \( (n = 6) \) of the respondents were under 30 years old, and 3.3% \( (n = 3) \) of the sample was over 60 years old. Thus, the sample mainly represents highly educated employees aged between 30 and 59 years. In general, this group might be considered as one of the prime target populations for CHIT.
3.3 Interpretation of the data

We interpreted the data through the PSD model (Oinas-Kukkonen and Harjumaa, 2009). It is a recent conceptualisation for analysing, designing, developing and evaluating persuasive systems. The PSD model consists of a set of PSD principles under four categories:

1. primary task support
2. dialogue support
3. credibility support
4. social support.

The design principles in the primary task category focus on supporting the user’s primary activities and goals. Design principles related to human-computer dialogue aid in achieving the goal set for using the system. The credibility support principles relate to how to design a system so that it is more credible and thereby more persuasive. The design principles in the social support category describe how to design the system so that it motivates users by leveraging social influence (Oinas-Kukkonen and Harjumaa, 2009).

4 Findings

4.1 Primary task support

Primary task support encompasses reflecting on one’s behaviour, personal goal setting, and tracking progress toward them. It also deals with essential issues such as reducing disorientation and cognitive load towards system use, and adapting to individual user’s tasks.

Harjumaa et al. (2009) argue that tailoring and credibility are closely related. In their study, users were more motivated to follow the training programme, because they knew that it had been tailored based on their personal data. Due to the perceived tailoring, the users perceived the system as more credible. In the present study, several respondents gave negative feedback regarding the rather generic and non-tailored health-related advice:

“I do not smoke, but still the health coaching sent me information regarding health dangers of smoking. Is it not possible to find more suitable range of themes based on the person’s basic information?” [Female, 58 years old]

“Some of the messages are too generic and there is repetition in the content nearly every week.” [Male, 38 years old]

“Too generic. For example, there is no point informing a 51-year-old female that being overweight at twenty years old predicts weight problems later on.” [Female, 51 years old]

The users are clearly more willing to engage with the system if the system reduces complex tasks into smaller subtasks. Some of the users reported that using the system was ‘nerve-wracking’ or ‘stressful’. Also, many users mentioned laborious data entry as a barrier to fully interact with the system:
“Boring and detached from existing coaching and exercise applications. Unable to integrate well to daily routines, such as calendar.” [Female, 31 years old]

“If the service would provide me with an electronic food diary I might continue using the service, but in its current form I find the service to be more frustrating than helpful in my battle against my weight. Regarding personal goal-setting the coaching could be useful, but since the service does not provide me with everything that I would need, I have to use several different systems.” [Female, 38 years old]

The importance of unobtrusiveness has been highlighted in the PSD model, being one of the postulates for any persuasive system (Oinas-Kukkonen and Harjumaa, 2009). It has also been identified by Consolvo et al. (2009) and Lehto et al. (2012). Consolvo et al. (2009) suggest that the data should be presented and collected in an unobtrusive manner, and the data should be available when and where the user needs it, without unnecessarily interrupting or invading users’ daily routines:

“In my opinion, Sunday morning was not a very good time to ask for feedback.” [Male, 50 years old]

“When you are filling in your information regarding your exercise, one option could be that you are ill. If you are ill, you should not move too much, and if you just look at the weekly exercise goal, somebody might be pushed to do exercise, even if ill, just to meet the weekly goal.” [Male, 44 years old]

“I got frustrated because of the too frequent monitoring.” [Female, 58 years old]

“I was on a sick leave, so I was not able to fill in my information. Due to the illness I was not able to exercise actively.” [Female, 53 years old]

Through empirical analysis, Lehto et al. (2012) found out that unobtrusiveness predicts perceived persuasiveness of the system, intention to use the system, and, very importantly, actual system use. Unobtrusiveness is also highly related to Kairos, “the right or opportune time to do something, or the right measure in doing something” [Kinneavy, (1986), p.80]. In the context of persuasive systems, Kairos refers to the opportune moment to intervene and represent a persuasive message to the persuadee (Fogg, 2003; Räisänen et al., 2008). According to Fogg (2009), timing has been overlooked in behaviour change. In his opinion, the right moment for behaviour performance is when motivation and ability put people above the behaviour activation threshold (Fogg, 2009). Segerståhl et al. (2010) emphasise that persuasive suggestions do not work if they are not timely (e.g., tips to avoid gaining weight during Christmas are being provided in summer time). According to Räisänen et al. (2008) the opportune moment varies greatly between individuals, thus complicating the design of applications leveraging Kairos to a great extent.

4.2 Dialogue support

It is commonly accepted that IT artefacts are social actors (Nass et al., 1994; Al-Natour and Benbasat, 2009) and people consider their interactions with IT artefacts as interpersonal in nature. In addition, people tend to react to IT artefacts as if they were interacting in social situations. In an experiment conducted by Looije et al. (2010) the subjects perceived the virtual and physical character as more empathic and trustworthy
than the text-based assistant, and expressed more conversational behaviour with the characters.

Dialogue support defines the key principles in keeping the user active and motivated in using the system and, ideally, helping the users to reach their intended behaviour. In dialogue support, system-to-user prompts, praise and reminders play an important role (Oinas-Kukkonen and Harjumaa, 2009).

The users of the virtual health coaching requested for more reminders in order to keep them motivated in their endeavours:

“At first, I was waiting to be reminded via e-mail. When I did not receive the reminders, I forgot about the whole thing.” [Female, 50 years old]

“I feel that the coaching stopped. Or is it because I did not update my information so actively any more?” [Male, 49 years old]

According to Consolvo et al. (2009) a key issue in system-to-user dialogue is being positive. They suggest that positive reinforcement should be used in order to encourage change. Moreover, the user should be rewarded for carrying out the desired behaviour and succeeding in achieving his/her goal, but should not be punished when the target behaviour is not performed (Consolvo et al., 2009).

“The program did not provide me motivational support me in any way and did not remind me if I had missed something.” [Female, 37 years old]

“Unfortunately, I feel that the virtual health coaching is too rigid and distant.” [Female, 51 years old]

Ideally, dialogue support promotes users’ positive affect or feelings, which will likely influence not only perceived enjoyment and actual use but also users’ confidence in the source (perceived credibility).

4.3 Credibility support

Credibility and trust are important, related constructs. According to Everard and Galletta (2005, p.60), the apparent difference between trust and credibility is that “trust is an attribute of an observer (to have trust), whereas credibility is an attribute of another person or an object of interest (to be credible)”. In their view, trust is a manifestation of credibility, which could be considered to be trustworthiness. Labels such as accepting the advice, trusting the information, and believing the output are seen as conveying computer credibility [Everard and Galletta, (2005), p.59]. Prior research on online trust has favoured dividing the trust component into various subcomponents, such as knowledge-based trust, institution-based trust, and cognition-based trust. According to Sillence et al. (2006) various factors are likely to govern the extent to which individuals feel they can trust health advice online:

1. credible and aesthetic visual design
2. branding of the site or presence of familiar images or trusted logos
3. quality of information (perceived expertise)
4. personalisation.
Credibility issues are paramount, especially within the eHealth context, as users will more likely abandon systems that they do not perceive credible and trustworthy. In this study, no credibility issues emerged from the qualitative open-ended responses. Furthermore, the participants perceived the system to be rather credible. Table 3 shows the perceived credibility assessments by the respondents. Four dimensions were measured: credibility; reliability; professionalism; and trustworthiness.

Table 3 Dimensions of perceived credibility assessed by the respondents

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Positive anchor</th>
<th>Mean (S.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credible</td>
<td>30 45 8 8 0</td>
<td>1.93 (.88)</td>
</tr>
<tr>
<td>Reliable</td>
<td>23 51 13 4 0</td>
<td>1.98 (.76)</td>
</tr>
<tr>
<td>Professional</td>
<td>30 45 11 4 1</td>
<td>1.91 (.85)</td>
</tr>
<tr>
<td>Trustworthy</td>
<td>28 49 11 3 0</td>
<td>1.88 (.74)</td>
</tr>
</tbody>
</table>

4.4 Social support/social influence

Our social relationships are increasingly maintained through technology-mediated communications. Using social networking systems and applications is a part of daily lives (both leisure and work) and routines of millions of individuals. Technology-mediated communications can aid in forming and maintaining online relationships that can facilitate social support. It is generally acknowledged that social support has multiple levels: emotional, instrumental, appraisal, and informational (e.g., Langford et al., 1994).

There is a growing body of knowledge, especially within the eHealth domain, regarding online social support. According to Barak et al. (2009) a variety of online groups are available in either synchronous or asynchronous formats: web-based discussion forums or bulletin boards, live chat rooms, e-mail lists. Compared to traditional therapeutic groups, online support might be more flexible with people joining or leaving at any time (Barak et al., 2009). Furthermore, anonymity and non-judgmental interactions are unique to online support (Hwang et al., 2010). Hwang et al. (2010) found out that the exchanged social support was in the form of encouragement and motivation, information, and shared experiences. Chiu et al. (2006) argue that social interaction ties, trust, norm of reciprocity, identification, shared views and language govern individuals’ knowledge sharing in virtual communities. They also argue that community-related and personal outcome expectations can kindle knowledge sharing in virtual communities (Chiu et al., 2006). Surprisingly, only few responses touched upon the issue of social support or social influence. This may be due to the fact that the system under investigation did not directly facilitate communication between users.

4.5 Reasons for non-adoPTION or abandoning the system

The study participants were asked to provide one to three most appropriate reasons for not using or abandoning the virtual health coaching. Out of the 91 users, 38 gave reasons for abandoning the system. In addition, 39 respondents (outside the sample of 91) gave reasons for not activating the virtual health coaching (i.e., they had done the initial virtual health check, but had not proceeded to the virtual health coaching). See Table 4.
Table 4  Reasons for not activating or abandoning the virtual health coaching

<table>
<thead>
<tr>
<th>Reason</th>
<th>Occurrence (non-adopters, ( n = 39 ))</th>
<th>Occurrence (‘abandoners’, ( n = 38 ))</th>
<th>Total occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not familiarised with the system yet*</td>
<td>27</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Do not have time to use the system*</td>
<td>1</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Not suitable for personal purposes*</td>
<td>6</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>The system is hard to use*</td>
<td>2</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Do not need it or do not consider useful*</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Technical issues*</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Privacy issues*</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Lack of motivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Lack of support</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Forgetfulness</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Unawareness</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Negative emotions towards the system</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Notes: Reasons marked with an asterisk (*) were given as options. Other reasons were given by the participants in the free text field.

The most distinct factors for not activating or abandoning the virtual coaching system were:

1. user was not familiarised with the system yet
2. no time to use the system
3. the system was not perceived suitable for personal purposes
4. the system was hard to use
5. the system was not perceived useful
6. technical issues.

The reasons listed above and their occurrences would probably follow a similar pattern also in a larger sample. Nevertheless, it would require further investigation to confirm the assumption.

4.6 Perceived system success

It has to be emphasised that in this paper we have concentrated on uncovering the shortcomings of the system. However, there were a lot of users who had favourable impressions toward the system.

We measured perceived system success with positively and negatively anchored items. As can be observed from Table 5, the respondents had rather positive perceptions towards the system.
Table 5  Dimensions of system success assessed by the respondents

<table>
<thead>
<tr>
<th>Positive anchor</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>Negative anchor</th>
<th>Mean (S.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interesting</td>
<td>51</td>
<td>26</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>Boring</td>
<td>1.74 (1.07)</td>
</tr>
<tr>
<td>Persuasive</td>
<td>18</td>
<td>49</td>
<td>16</td>
<td>7</td>
<td>1</td>
<td>Unconvincing</td>
<td>2.16 (.87)</td>
</tr>
<tr>
<td>Successful</td>
<td>19</td>
<td>45</td>
<td>20</td>
<td>6</td>
<td>1</td>
<td>Failure</td>
<td>2.18 (.88)</td>
</tr>
<tr>
<td>Useful</td>
<td>32</td>
<td>40</td>
<td>12</td>
<td>6</td>
<td>1</td>
<td>Useless</td>
<td>1.95 (.92)</td>
</tr>
<tr>
<td>Functional</td>
<td>17</td>
<td>45</td>
<td>22</td>
<td>7</td>
<td>0</td>
<td>Non-functional</td>
<td>2.21 (.84)</td>
</tr>
</tbody>
</table>

5 Discussion

PSD is an intriguing domain of research and practice. This study adds to the related body of knowledge by demonstrating the important role of persuasive systems design in adoption and use continuance of a BCSS. To decrease attrition, increase retention and system use it is essential to design, implement, and evaluate features that participants find attractive and engaging. As Sillence et al. (2006) suggested, design issues have real implications: the quality and the content of a system is inapplicable if users perceive the system as poorly designed. Hardiker and Grant (2011) called for continuous attention on appropriate design and content of eHealth services, which are suitable for a diversity of potential end-users in a way that is in harmony with their everyday lives.

Regarding the primary task support of the BCSS under investigation, many of the users gave negative feedback regarding the general and non-tailored health-related advice. This finding emphasises the need for designing and developing tailored health-related services. Furthermore, many users were already using different applications or systems to maintain their well-being. Since many of these systems are not interoperable, the user might have to input the same data into several locations, thus diminishing primary task support (also ease-of-use and usefulness) significantly. Another important issue is the unobtrusiveness of the system, i.e. the system has to fit into the regular daily lives of the users (Oinas-Kukkonen and Harjumaa, 2009; Lehto et al., 2012). The system has to take into account unpredictable events such as illness of the user, but also adapt to more mundane events such as a holiday season or a long work trip.

In terms of dialogue support, the users requested for more reminders in order to keep them motivated in their endeavours. The dialogue support may be reinforced, for instance, by providing users with virtual rewards upon reaching certain goals or performing specific tasks.

None of the respondents explicitly mentioned credibility issues, and the credibility assessments were rather positive. We believe that institution-based trust bolstered the perceived credibility of the BCSS under investigation.

As anticipated, perceived usefulness (or value-for-user) was mentioned quite a few times. Some of the respondents did not see the point of continuing using the virtual coaching system. Rather low amount of respondents gave feedback regarding technical issues averting the use of the system. This might be partially explained by the fact that the majority of the respondents were ‘white-collar’ workers with a university degree. It can be expected that highly educated people experience less technical difficulties.
It has to be noted that persuadees do not necessarily adopt systems based upon their persuasiveness (cf. Friestad and Wright, 1994). More importantly, it has to be emphasised that technology is not the solution for everything. In fact, there are emerging challenges such as ‘technostress’ (Ayyagari et al., 2011) and fatigue towards social networking, or even ‘social overload’ (Maier et al., 2012). In addition, enjoyment towards system use has been frequently identified as a desirable trait, since it can drive various aspects of system use (Turel and Serenko, 2012). However, through the positive reinforcement it brings about, enjoyment can also be a key element in the formation of adverse outcomes, such as technology-related addictions (Turel and Serenko, 2012). Turel and Serenko (2012) argue that there is a danger that enjoyment can also bolster the development of a ‘bad habit’, that may lead in a strong psychological dependency on the use of the IT artefact (i.e., technology addiction).

There are limitations to this study. The sample size is relatively small, and biased towards highly educated workers. Moreover, all of the respondents were from Finland. Also, there was no measurement whether actual behaviour change took place though the virtual health coaching. Ideally, it would be relevant to link the PSD principles to tangible outcomes. For instance, in the context of virtual health coaching – did the users follow the coaching instructions, and consequently enhanced their health? Even more importantly – was there a detectable permanent change or just a momentarily one? These are open paths for future research endeavours.

6 Conclusions

The present study examined consumers’ insights on a particular behaviour change support system, and it adds up to the body of knowledge on understanding the factors contributing to successful engagement with consumer health IT. A persuasive systems design perspective was chosen to examine consumers’ perceptions of a behaviour change support system. Clearly, BCSSs are at the heart of persuasive technology research and practice. These systems can bring many advantages to their users. However, these benefits cannot be achieved if the systems fail to engage and retain the users. For designers and developers of such systems, the work implies that building appropriate persuasive mechanisms into the system can increase the likelihood of adoption and use continuance. Technology may provide the means to aid the individual users in their tasks but one of the key issues to successful implementation and prolonged use and frequent engagement may depend on whether users have the opportunity to use the system as a seamless part of their daily routines (unobtrusiveness).

Consumer health IT can draw advantage of the web and mobile technologies as well as social networking. The application area is full of promise, for both the consumers and designers of related applications, products, and services. Investigating the adoption, use and impact of CHIT is feasible as it will guide future implementations of such consumer-centric technologies. Much of the theory and approaches in human-computer interaction and information systems apply to the field of consumer health IT. Nevertheless, when striving for effective consumer health applications and engaging user experiences, it may be necessary to shift the focus from traditional to more contemporary approaches. To this end, PSD can be one of the main paths to follow.
Acknowledgements

The study was supported by the SalWe Research Program for Mind and Body (Tekes – the Finnish Funding Agency for Technology and Innovation Grant 1104/10). An earlier version of this article was published in WIS 2012 conference proceedings: Eriksson-Backa, Kristina – Luoma, Annika – Krook, Erica (Editors), Exploring the Abyss of Inequalities, Proceedings of the 4th International Conference on Well-Being in the Information Society, WIS 2012, Turku, Finland, August 2012, Communications in Computer and Information Science 313, Springer. This version has 50% new content.

Conflicts of interests

Two of the authors (TP and OS) are working for the company that developed the system under investigation.

References


Virtual health coaching for consumers


