

Web-Based Stress Management System Goes Mobile: Considerations of the Design of a Mobile Phone App

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Abstract. High levels of stress at work, great demands and lack of balance between work and family; these are examples of components in the daily lives of many people in modern society. Interventions of different kinds are needed. However, changing patterns of thinking and behaviors is not an easy task, and it demands for continuous support and learning efforts. This paper presents a web-based stress management system and the way it was transferred to a mobile phone app. The solution and considerations are presented. The design principles of the web-based system were used to examine the use of the mobile phone app. The results showed that the app to a large extent meets the design principles, and some of the principles seemed even more applicable in the mobile phone setting due to its mobility.

Keywords: Mobile phone app, stress management, web-based, design principles, functions, stress areas.

1 Introduction

Today many people are on sick leave as a result of high levels of stress [1]-[2]. Studies show that high or unclear demands, low control and low social support at work increase the risk of "job stress". If this state of high levels of stress is prolonged, the risk of impaired health gets high. There may also be a disturbance in the balance between work and family when the demands of one sphere do not comply with the requirements of the other, or when the individual's efforts to fulfill its role in the work are affected negatively by the demands from family [3]-[4]. Social support at work or in private life has a mediating effect of perceived stress, and can to some extent, prevent negative stress.

Prevention and health promotion measures aim at creating attitude and behavioral changes in people who suffer from stress symptoms. Empowerment is a central concept for increasing control in life. An important question is how to build on and reinforce authentic participation, a sense of value and mastery in decision making.

As for individual efforts in stress management to deal with negative stress exposure, Jacobson was first to design a program of progressive muscle relaxation to guide people to achieve relaxation [5]. This can prevent stress reactions. It has been concluded that the effectiveness of interventions varies according to health-outcome measures being used [6]. However, to combine different techniques for muscle relaxation and cognitive-behavioral skills have seemed to be more effective across a variety of health-outcome measures than using a single technique [6].

When dealing with stress-related health problems the Internet can play an important role, with its facilities for exchanging information and support, as well as opportunity to have continuous interactions. Through web-based systems, people with high levels of stress can more easily come into contact with health professionals and peers for support and get support on a continuous basis. Self-help groups on the Internet have evolved in different health areas; stress and coping with stress constitutes one. There are also various types of web-based intervention systems that use different types of models for dealing with people's stress. However, available web-based systems today tend to focus on either information or communication, and to separate guidance from health experts from social support among peers.

In an attempt to close this gap, we have previously developed a web-based system that takes into account the benefits of having different actors and types of support coming together [7]-[9]. The web-based system has now also been transferred to a mobile phone setting. Since a mobile phone has certain characteristics that differ from a computer, new conditions follow. The advantage of being available to the user in most social situations need to be exploited, but also poorer properties such as a smaller screen and less performance need to be taken into account [10]. This paper presents considerations as well as preliminary results of the mobile phone app development.

In next sections, the web-based stress management system and its design principles are introduced. Thereafter, the mobile phone app is presented. The purpose was to let the mobile phone app be an extension of the web-based stress management system, designed in accordance with the principles used for the web-based system (presented in [7], e.g.). Therefore, we also compare functionality of the mobile phone app and the web-based system, and examine the mobile phone app based on the design principles used for the web-based system. The paper ends with some concluding remarks.

2 The Web-Based Stress Management System

To manage stressful life situations, to develop and maintain a healthy lifestyle and inner balance, can be difficult. E-health communities can contribute to this process through its ability to foster continuous interaction between members. Previous studies have shown that knowledge from health experts and experiences of peers can create a good synergy; the use of web-based ask-the-expert functions, between citizens and experts, and conversations among peers in e-health communities has shown to offer different and complementary support [11]-[12].

2.1 Design Principles

The web-based stress management system is based on eleven design principles generated through research. This section provides an introduction to these design principles.

1. Social and Learning Activities. Well-functioning web-based communities foster social and empathical communication [13]-[14]. At the same time, they need to support the learning processes regarding stress and how to manage stress. Both social and learning activities must therefore coexist.

2. Integration of Knowledge and Actors. Health experts and peers possess different kinds of knowledge and experiences and contribute differently to the system. If diversity is allowed in the system instead of having actors and knowledge kept separate, new understanding is more likely produced. To have direct communication with peers and also with health professionals can create a turning point for people trying to manage a stressful life situation.

3. Extended Relations. New materials and new ideas can be introduced when different health experts are invited to online conversations. Also, people with previous symptoms of stress, who have managed to recover from difficult situations in life, can contribute with their insights. By this, both strong-tie and weak-tie relationships are made possible [15].

4. Learning Conversations on Stress. Through questions and conversations about practical situations, experienced and anticipated difficulties and issues of motivation, users can get help in their learning processes and become more aware of them [12].

5. Tagged Conversational Topics and Acts. In order to allow users to navigate easily among conversations, topics and answers could be tagged by content and type of response. This could also help users to reflect on stress-related issues and to gain increased awareness of learning processes.

6. Variety Management in Stressful Situation. The system should help the users to boost their resources and strategies in order to better manage and prevent stress. This can be done in various ways, through a battery of actions, such as advice on how to approach a specific stressful situation, and how to filter the environmental signals and experienced demands, as well as guidance on how to perform physical exercises to relieve tension.

7. System Diversity and Variety. Individual differences in terms of personal stressors and reactions [16]-[17] must be handled by the system. Various stress-related areas can enable people with different needs to navigate between perceived stress situations, information sources, exercises and discussions.

8. Continuous Learning. Continuous efforts are needed for people who want to change unhealthy behaviors and patterns of thinking. Therefore, it is important that the system has mechanisms for ongoing support in everyday situations.

9. Viable Platform. The system in itself should be learning based on the users and user patterns. By identifying repeated conversation topics and requests from the users, feedback on what goes on in the users' lives is available, and the system can be

adjusted when necessary. For example, exercises can be adjusted to better fit the stress symptoms among the users.

10. Multimedia for Virtual and Real Life Integration. Communication between the system's medical staff and the ones with stress symptoms can be supported by multimedia applications. Breathing exercises can, for example, be easily demonstrated through online video clips, and also other physical exercises and instructions can benefit from using multimedia. The recorded exercises can be performed by the users whenever they choose. Other types of tools can be used to support the dialogue and make them richer.

11. Embedded Feedback Mechanisms. The system should include stress measurements such as physiological markers and self-reporting since they help measure the users' learning progress. Results from these tests could also be useful to identify additional needs that the system should meet.

2.2 The Web-Based System Design

The design principles presented in the previous section constitute the basis of our web-based stress management system. The system is a self-help system for stress management outgoing from the idea that both stress experts and peers should contribute with their different skills and experiences. The system provides the user with information in the form of research and real life stories, practical exercises (both text and image-based) and opportunities to have conversations with different groups of participants, with both stress experts (through ask-the-expert function and group counseling) and peers (through forums and group counseling). As the different active participants and the various types of support are combined in one system, we call the system a multiple-help system for stress management [7]-[9]. The stress management system is also divided into four different stress areas: Sleep, Work and study, Balance in life (work-study-life balance) and Physical well-being, based on previous research [3]-[4], [18], [19]. Variety among the users with stress symptoms has to be met by variety of the system.

3 Transfer to a Mobile Phone App

We now move on to describe the design of the recently developed prototype of a mobile phone app for stress management. The work involved how to use the basic ideas and functions in a mobile setting. The technical platform used is Android.

3.1 The Mobile Phone App Functions

When the mobile phone app is started, it displays the five different types of help or functions of the system together with explanatory text. There is also a button in the lower corner that provides brief information of the app and the research project. This home page is seen on next page (Fig. 1). The five types of help, or functions, available in the system are (from the top): Book counseling session, Research and real life stories, Ask-the-expert, Exercises and Forum.



Fig. 1. Home page of the mobile phone app for stress management (in Swedish)

The functions work as follows.

Book Counseling Session. The function displays the group counseling sessions related to the stress area selected via a spin component (android technique). If the user clicks on one of the counseling sessions, a dialog with information of the chosen counseling session is shown, and also a button to be used for signing up and another one for cancelling a session. Another dialog box will then appear in which the user can save the time and date of the session in the calendar on the phone. The user cannot see registered counseling sessions in the app but only in the phone calendar. The user is not able to attend the group sessions via the app; instead, he or she needs to be online in the web-based system to participate in the registered sessions.

Research and Real Life Stories. The user can choose to either read or listen to the documented research results and stories told that are related to the stress area selected. Depending on what options are selected in the tab sliding drawer, data from the web-based system are filtered and presented accordingly. The app is prepared to present information as text or played as audio sound. If sound is the option, the audio file is streamed from the web-based system.

Ask-the-Expert. The user can see the frequently asked questions and answers for each stress area and also post own questions. To submit questions, the user clicks on a button for "Ask question" presented in a sliding drawer at the bottom of the page. In a questionnaire, the user can specify the stress area in question, add a title to the question and type the question itself. At the moment, the app solution does not allow the expert's answer to be presented in the app; instead, the answer is handled through the web-based system and sent as a personal e-mail to the sender of the question. Eventually, it is also presented among the frequently asked questions and answers.

Exercises. The user can read, see or listen to the exercises related to the stress area being selected. As in "Research and real life stories", the app is prepared to support the formats selected by the user via buttons located in a sliding drawer. If the user clicks on an item in the list, text is displayed or video and/or sound streamed from the web-based system.

Forum. The user can actively participate in conversations with peers. As the web-based system uses a pre-programmed standard forum system, the phone app adds a link to the forum (via WebView) instead of retrieving the separate messages. Since the standard forum system, VanillaForums, supports mobile phone apps, the interface is automatically adjusted. The way it is displayed can be seen below (in Fig.2).

3.2 The Functions in Relation to Stress Areas

When one of the functions has been activated (“Forum”, e.g.), the system will display a new page with actions available, and also with all the five functions visible through a tab system (as presented in Fig.2). The five functions have been given the following tab names: *Råd* (=Advice): Booking of counseling sessions, *FoB* (=R&S): Research and Stories, *FAQ*: Ask-the-expert, *Övn* (=Exc): Exercises and practical tools, *Forum*: Forum for conversations.

The figure below shows also how the four different stress areas implemented in the web-based system are displayed. The stress areas are (from the top): Work and study, Physical well-being, Balance in life and Sleep. By clicking on one of the areas, conversations on topics related to it can be read and taken part in.

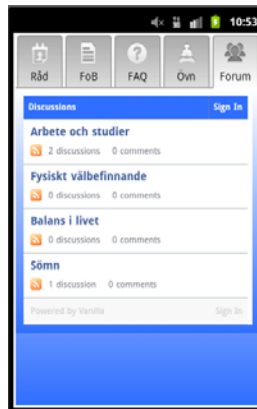


Fig. 2. Page showing the five different functions at the top. “Forum” is activated and forum discussions in the four stress areas are displayed via WebView (in Swedish).

The forum function of the system is treated differently since it uses a pre-programmed standardized forum system. The other four functions, however, have been able to be programmed from scratch and adjusted to the overall phone app interface. On next page is an illustration of the tab for *booking counseling sessions* (Fig.3). The chosen stress area is *balance in life*. In the text box, information about the scheduled counseling session is given (title, date, time and maximum participants).

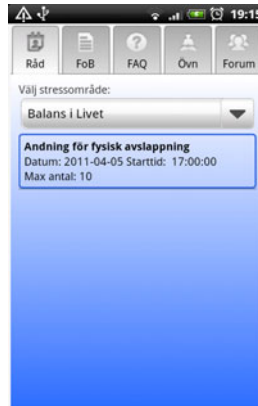


Fig. 3. Page for booking counseling sessions. It illustrates how a session is displayed in the area dealing with issues related to balance in life (in Swedish).

3.3 Comparison of Functionality

In order to find out about similarities and differences in functionality between the two systems – the web-based system and the mobile phone app - the main five functions of the systems were compared (see Table 1).

Table 1. Comparison between the web-based system and the mobile phone app regarding the main five functions

Function	Web-based system	Mobile phone app
Research & real life stories	Presentation of stories and research as both text and sound.	Ability to choose between reading or listening to selected stories and research (via 'sliding drawer').
Practical tools, exercises	Presentation as text, sound and video clips.	Presentation as for Research & real life stories. Video clips are also available.
Ask-the-expert	Frequently questions and answers are presented. The user can post new questions (and receive personal answers through e-mail).	Frequently questions and answers are presented. The user can post new questions (and read personal answers through e-mail).
Group counseling	Information on upcoming counseling sessions are displayed, and the user can sign up for one or more sessions. Information about registered sessions are displayed. The session takes place in a certain chat area in the system.	Information on upcoming counseling sessions are displayed, and the user can sign up for one or more sessions. The user can also add the session to his/her phone calendar.
Forum	The forum system offers a participation and displays questions and answers between peers.	As the web-based system uses a pre-programmed standard forum system, the phone app offers links to the forum system (via WebView).

3.4 Evaluation Based on the Design Principles

In addition to comparing functionality between the two systems, the design principles of the web-based system were used to conduct a minor evaluation of the mobile phone app. This is a summary of the evaluation results.

Social and learning activities take place through the app. Linking the app to the web-based forums and ask-the-expert function sessions allows for communication among peers, and also with experts. To allow for **integration of knowledge and actors**, the app communicates and displays information, exercises, forum discussions, etc., to and from the web-based system. Thereby, the two systems together let both health experts and peers contribute in different ways. Expert answers to own posted questions still need to be worked on technically in order to have them displayed in the mobile phone. **Extended relations** are possible in both environments. Through the app, **learning conversations on stress** among peers (on practical situations, difficulties, motivation, etc.) are possible to follow and participate in. The question of **tagged conversational topics and acts** is to be dealt with by the web-based system (standard forum system). A battery of actions are available that allows the user to be better equipped for dealing with stressful situations, and thereby increasing his or her **variety management in stressful situations**. This is also related to empowerment among the users. Also, individual differences are handled by the system through its stress areas (the same as in the web-based system) and its different types of help, allowing for **system diversity and variety**. Furthermore, **continuous learning** is something even more emphasized and evident in the mobile phone setting, where ongoing support in everyday situations is possible. The app is strongly related to the web-based system and should be adjusted to changes in the web-based setting, thereby allowing for a **viable platform**. The app is designed to be prepared for addition of stress areas, e.g. The app uses **multimedia for virtual and real life integration** when demonstrating physical exercises, such as breathing techniques through online video clips. The mobile phone setting allows the user to view exercises independent of both time and place. So far, **embedded feedback mechanisms**, in the form of stress measurements, are to be handled by the web-based system and will eventually be available in the phone app.

4 Final Remarks

In this paper, we have presented a prototype of a mobile phone app for stress management associated with a web-based system. So far, the mobile phone app has shown promising results when evaluated by criteria from research in the area of stress management and online support. This preliminary work will be followed by user-based evaluations to identify needs to be addressed in the next iteration of design.

References

1. Henderson, M., Glozier, N., Holland, E.K.: Long Term Sickness Absence is Caused by Common Conditions and Needs Managing. *BMJ*. 330, 802–803 (2005)
2. Dekkers-Sánchez, P.M., Hoving, J.L., Sluiter, J.K., Frings-Dresen, M.H.: Factors Associated with Long-Term Sick Leave in Sick-Listed Employees: A Systematic Review. *Occup. Environ. Med.* 65, 153–157 (2008)

3. Sandmark, H.: Work and Family: Associations with Long Term Sick-Listing in Swedish Women. *BMC Public Health* 7, 287 (2007)
4. Sandmark, H.: Job Mismatching, Unequal Opportunities and Long-Term Sickness Absence in Female White Collar Workers in Sweden. *Scand. J. Public Health*. 37, 43–49 (2009)
5. Jacobson, E.: *Progressive Relaxation*, 2nd edn. University of Chicago, Chicago (1938)
6. Murphy, L.R.: Stress Management in Work Settings: A Critical Review of the Health Effects. *American Journal of Health Promotion* 11, 112–135 (1996)
7. Smedberg, Å., Sandmark, H.: Multiple Help Online: An Integrated E-Health System for Stress Management. In: *Proceedings of IADIS International Conference E-Health*, Freiburg, Germany, July 29-31, pp. 151–158 (2010) ISBN: 978-972-8939-16-8
8. Smedberg, Å., Sandmark, H.: Stress Intervention Online - Designing for Self-Help through Multiple Help. In: *Proceedings of the Third International Conference on eHealth, Telemedicine, and Social Medicine*, Guadeloupe, France, February 23-28, pp. 120–125 (2011) ISBN: 978-1-61208-003-1
9. Smedberg, Å., Sandmark, H.: Dynamic Stress Management: Self-Help through Holistic System Design. In: Smedberg, Å. (ed.) *E-Health Communities and Online Self-Help Groups: Applications and Usage*, pp. 136–154. IGI Global (2012)
10. Jones, M., Marsden, G.: *Mobile Interaction Design*, 1st edn. Wiley-VCH, Chichester (2005)
11. Smedberg, Å.: To Design Holistic Health Service Systems on the Internet. *Proceedings of World Academy of Science, Engineering and Technology*, 311–317 (November 2007)
12. Smedberg, Å.: *Online Communities and Learning for Health - The Use of Online Health Communities and Online Expertise for People with Established Bad Habits*. Doctoral Thesis. Department of Computer and Systems Sciences, Stockholm University (2008) ISBN: 978-91-7155-689-9
13. Preece, J.: Empathic Communities: Balancing Emotional and Factual Communication. *Interacting with Computers* 12, 63–77 (1999)
14. Preece, J.: *Online Communities – Designing Usability, Supporting Sociability*. Wiley & Sons (2000)
15. Haythornthwaite, C.: Social Networks and Online Community. In: Joinson, A., McKenna, K., Postmes, T., Reips, U.-D. (eds.) *The Oxford Handbook of Internet Psychology*, pp. 121–137. Oxford University Press, United Kingdom (2007)
16. McEwen, B.S.: The Neurobiology of Stress: From Serendipity to Clinical Relevance. *Brain Res.* 886, 172–189 (2000)
17. Levi, L.: Working Life and Mental Health - A Challenge to Psychiatry? *World Psych.* 4(1), 53–57 (2005)
18. Siegrist, J., Marmot, M.: Health inequalities and the psychosocial environment—two scientific challenges. *Soc. Sci. Med.* 58, 1463–1473 (2004)
19. Preckel, D., von Känel, R., Kudielka, B.M., Fischer, J.E.: Over Commitment to Work is Associated with Vital Exhaustion. *Int. Arch. Occup. Environ. Health* 78, 117–122 (2005)