

Online Stress Management: Design for Reflections and Social Support

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Abstract: An increasing number of people suffer from high levels of stress and experience strong and unhealthy reactions to different stressors. Various kinds of applications for self-help are available on the Internet. However, the technology for stress management purposes is still in its early phase. This paper presents the ideas behind the design of an artifact that combines different technologies and offers support for individual as well as social reflections. The work is anchored in conventional system development methods and interdisciplinary research in the field of e-health. It is based on the holistic idea of combining areas of self-help, evidence-based information and learning through feedback and communication in groups and with experts that have been manifested in a web-based stress management system. The work presented in this paper is a further development towards integration of different technologies and learning aids. It integrates a mobile phone app with a web-based system for people with stress management issues. The proposed system supports social reflections through the possibility to share reflections in various social forums.

1 INTRODUCTION

Sick leave due to mental illness is a growing problem in Sweden and other countries in the Western world. High levels of stress have become an increasingly common condition in people's everyday lives. Work life is more complex than previously and puts demands on our cognitive abilities to keep up with technological developments, increased competition and constant change. Factors in certain areas of the work environment such as work organization, management, hierarchy, and interpersonal relations can trigger stress reactions which are associated with psychosocial strain. Great demands from the outside world can lead to unhealthy stress levels in individuals. Grandey and Cropanzano (1999) describe how the requirements of the job and at home have grown for the whole family. There is also a historical expectation that women take care of the family. Multiple demands from family and work can increase negative stress and be a challenge especially to women's health and well-being, and a determinant for long-term sickness absence and less well-being. Several studies have shown that those who have multiple roles and demands are more exposed to negative stress,

resulting in physical and psychosocial dysfunctions (Scharlach, 2001; Nordenmark, 2004; Hallsten et al., 2002).

Earlier studies found that domestic workload, mainly connected with own children, has increased for men and women, but to a greater extent for women during the past twenty years (Lundberg et al., 2003; Voss et al., 2001).

The load in family life and in the workplace is considered to have a correlation. Grandey and Cropanzano (1999) point out that the strain grows significantly when the discrepancy between the expectations of the family and the expectations from the workplace increases, and if any of the areas have to stand back.

However, it is a rather complex issue, since people react differently and to different stressors. People who work and live under the same conditions can therefore react in different ways. The individual's subjective experience of a condition and a situation affect whether and what symptoms are developed (Henderson et al., 2011). Stress is an individual combination of external reality, individual perception of the situation and the estimated capacity to solve the problem.

Some people require a change in lifestyle to deal

with problems of stress reactions. Continuous and social support has shown helpful when managing stress and change of lifestyle (Karasek and Theorell, 1990). Studies have shown that the social aspect of learning is also important to consider, and to reflect together with others. Online support groups and reflection tools have shown to influence people with the symptoms of stress positively (Sandmark and Smedberg, 2013).

Tools that address e-health come in many different shapes and technologies. The technologies differ in strengths; mobile phones can be used independently of space, apps tend to have defined tasks, while computers are normally better suited for processing information and doing analysis. Regarding systems for stress management, there is no consensus regarding how such a system should be designed in order to combine on the one hand the advantages of different technologies, and on the other hand complementary areas of e-health, such as self-help, social and individual reflections, communication and information. This paper will investigate a holistic design where different components and technologies are combined. Design Science was used as a framework to iteratively build a prototype of an online stress management system. The system is a development of the web-based stress management system described in previous publications (see Smedberg and Sandmark, 2012, e.g.).

The next section (section 2) discusses stress management and online self-help. The following sections (section 3 and 4) describe the design considerations and the proposed system, followed by a user scenario (section 5) and, finally, conclusions and future work (section 6).

2 BACKGROUND

2.1 Stress Management

Stress is about biological and psychological responses to situations that are perceived as threatening or challenging. A stress reaction is caused based on an individual combination of external reality, the human perception of the situation and the estimated capacity to solve the problem.

To manage work-related stress, effective interventions connected to the workplace are necessary. Interventions regarding stress in the workplace could focus on the individual or on the organizational level (Czabala et al., 2011). Thus

there are two different approaches to manage work-related stress. At the individual level, relaxation and cognitive-behavioural techniques have been applied to improve an individual's mental resources and responses. At an organizational level, job adjustment and workplace communication activation have been applied in order to improve the occupational context.

However, in earlier intervention studies regarding the organization level the effect was limited. Individual level interventions such as cognitive-behavioural approach comprising coping techniques has so far been found to be more effective, although the long term effects are not yet fully known (Giga et al., 2003; Czabala et al., 2011).

2.2 Self-help Online

Barak et al. (2008) emphasize that the communication in online communities influence on people's well-being positively and that the writing process is a good technique to structure thoughts and feelings. When sharing experiences one has also begun to reflect on these. Barak et al. (2008) describe how the online forums can increase people's personal empowerment and may affect their ability to make decisions. The observed positive effects depend, among other things, on confirmation from the group. The individual wants to be understood and have the experienced situation acknowledged by the others. Also the fact that participation is voluntary and that you can help others with your own experiences is beneficiary when personal empowerment is concerned. To share burdensome emotions with others and to feel socially involved in the group have shown to result in a sense of relief (Barak et al., 2008).

A positive self-image and social identity affect people's mental health (Aneshensel et al., 2013). Wenger (2004) describes how social identity can be shaped and social learning take place in communities. He argues that individuals are influenced by others through the group views and competences presented in the community. In order to have a healthy community, learning should also take place on the boundaries, according to Wenger. This means that we need to be open for new ideas, 'experience in the world', and have them combined with the competence of the community.

Positive effects such as greater empowerment have been seen in patients who engage in online support groups (Barak et al., 2008; van Uden-Kraan et al., 2008). Online support groups constitute a self-management tool that allow for an autonomous patient role (Barrett, 2005; McGowan, 2005).

Through the group, experiences, advice and recommendations can be shared.

One possible disadvantage of these types of peer-to-peer groups is that they can spread misinformation which leads to unhealthy behavior. It can also take some time before people feel comfortable in the group (Barak et al., 2008). Barak notes that online groups do not replace the necessary therapy.

2.3 Self- and Group-reflections

Self-reflection is one tool among other to manage stress reactions and deal with situations that cause stress. Reflections on situations can help people understand what is beneficiary and what causes disadvantages to their health.

Reflection is about discussing situations that are perceived to be complex or uncertain (Creek and Lougher, 2008). By reflecting, one can illuminate a situation from different angles and correct the mental image that was constructed initially. Self-reflection can then reform the perspective of a situation or action (Mezirow et al., 1990).

Mezirow et al. (1990) describe how critical reflection triggers learning in individuals. Among other things, they describe how critical self-evaluation helps people to re-evaluate their experiences, knowledge, beliefs, feelings and actions. They believe that critical reflection aims at the question "Why?", and that the answer will be the causes and consequences of one's actions in the future. They also point out that the critical self-reflection is a highly significant method for learning among adults.

Westberg and Jason (2001) ask the question why reflection and self-evaluation are important. Results from studies of medical care students show that reflections help students build new skills. Reflection helps to identify gaps in knowledge and correct the error in reasoning. By reflecting and be self-critical, learning time can also be shortened. As an example, Westberg and Jason (2001) refer to trainers that let athletes look at their own performances and evaluate them critically. The method has shown to increase the rate of learning in athletes.

3 DESIGN CONSIDERATIONS

The practical work with the design of a system prototype for self-reflection was done iteratively outgoing from interdisciplinary research in the area of stress management online. The holistic idea of

combining ICT tools for self-management, evidence-based information and learning through feedback and communication in groups and with experts have been investigated in previous studies and manifested in a web-based platform (Smedberg, 2007; Smedberg and Sandmark, 2011). The prototype for self-reflection was designed through four iterations, each with the following steps: 1) a discussion in the online stress management team to clarify the problem to be solved and the requirements, followed by 2) development and demonstration, and then 3) evaluation of the prototype version by the online stress management team. Below, the basic considerations for the design of the prototype are presented.

3.1 Preventive Care

The design should consider the aspects of preventive care. Since the target group is people with stress symptoms, the system is to support them in their daily working or student life, and to help them reach increased well-being. Stress exists in all persons in a varying scale. It is manifested differently in people, and it also accelerates through different phases, according to Selye (1985). It is therefore beneficiary for the user if one can be aware of unhealthy stress levels and associated problems as early as possible.

3.2 Analysis of Data and Trends for Self-reflection

The user must have the ability to process and analyze data in order to change behavior in the future. As discussed earlier, reflection has shown to be an effective learning method (Mezirow et al., 1990). It is therefore important to be able to see trends and historical data of the stressful situations that the user experiences.

To serve this purpose, the prototype should support the collection and presentation of different pieces of data related to the stressful situations of the user. Stress levels, textual descriptions, images, time and a geographical context are examples of types of data that are related to the stressful situations of the users.

To customize the visualization of trends is also important, and to be able to focus on a certain period of time. It is important to note trends to be able to reformulate one's perception so that new values can be applied in future decisions and actions (Mezirow et al., 1990).

In the prototype, it should be possible to highlight a situation as private or work-related. Stress-related problems often increase when stressful situations occur in both private and work-related

contexts, according to Grandey and Cropanzano (1999). If this data is made visible, trends and patterns can be analyzed and changed.

3.3 Sharing for Social Support

A system should take into account the good influences that online social groups have demonstrated. Support from other members can create a social identity (Wenger, 2009), increase self-confidence and contribute to a positive self-image. Communication in social groups and online forums has shown positive effects, such as increase in self-respect and empowerment among the users (Barak et al., 2008). The prototype should therefore also support the need to gain social support and not only focus on individual reflections.

3.4 Holistic Design - Complementary Knowledge and Actors

Different actors, both experts and peers, have shown to be able to share complementary understanding of health-related issues in online systems (Smedberg, 2007). While peers contribute with their experiences and practical advice, for example, medical experts can offer in-depth knowledge and understanding of different health-related issues. For the prototype, this means that both experts and peers are to be regarded helpful for social support and group-reflections.

The prototype is also to be integrated with the existing web-based platform that supports the combination of different knowledge and experiences. In this system, there are functions for communication with both stress experts and peers implemented already. The existing functions are: Ask-the-expert, Forums for peer communication, Online consultation for group counselling session (chat), Practical exercises (text as well as sound and video recordings) and Stories told and research results (see e.g., Smedberg and Sandmark, 2012). The different functions are organized in four different stress management areas: Sleep, Work and studies, Balance in life and Physical well-being.

3.5 Simplicity

The design must be simple, especially since the target group is people with stress symptoms, it is important not to increase the level of stress caused by system complexity. It is important to remember that people with symptoms of stress may have physical and mental constraints. The prototype uses accepted design principles according to Nielsen (2001) and the recommendations of the Swedish

Government's Workgroup Use Forum (2014). Particular emphasis has been placed on the principles of "Simplicity" and "Understanding the context" in these recommendations.

In rule 53 of the design guidelines recommended by Nielsen (2001), it is said that the system should offer the user direct access to high-priority information. This is also relevant for the design of the prototype.

3.6 Flexibility

Considering the differences among people with stress issues, their lives, experiences and stress reactions, the design of online stress management systems need to be flexible. Since stress is also affected by the level of control, stress management online has to let the user experience a sense of control and be empowered. This includes being able to freely navigate in the system, to get the information wanted and choose whom to talk to. The user should be able to decide if individual reflections should be in focus one day, and social interactions and group reflections another day.

4 THE PROTOTYPE

This section outlines the prototype system for self-reflection that is the result of the iterative design process and based on the design considerations presented in the previous section.

4.1 The System Boundaries

The prototype is a web-based system for self-reflections on stress and patterns of events, and for initiating reflections in groups. It is fed by data from a mobile phone app in which events that cause stress reactions are registered. Data about these events are then used to visualize patterns of stress reactions – frequency, scope and time - over shorter and longer time periods. By putting data in relation to each other, the user can reflect on unwanted events from a broader perspective. The goal is also to have the prototype integrated with the larger web-based stress management system where social interactions, reflections and advice from stress experts and peers can take place.

4.2 Functionality

Stress situations that the user has registered through

the mobile phone app can be displayed in different ways in the prototype. The prototype should support analyses and reflections, with customized display of data. As can be seen in figure 1, historical data of events can be presented according to both frequency and level. The user chooses a time period for the presentation. In the example in figure 1, the time period is one winter month and the results show that during this time frame 22 stress situations were registered by the user, of which some were classified as causing high stress levels (80-100) on the scale of 1 to 100. By clicking on a registration presented in the chart, the date of the registration will be visible. Figure 1 shows also stress levels of the registered situations from the last 15 days so that the user can monitor the latest development of his or her stress levels.

The prototype offers also a visualization of all registered situations on a map (see fig. 2). It shows how many times there have been situations registered in a particular geographical place. It is also possible to view the data as a geographical trend. The places in question are marked out on the map and different colours are used to illustrate the frequency of reported stress situations. When looking at the registered stress situations, one by one or in a certain time frame, the user can add his or her reflections. In figure 3, the time frame chosen is five days in December of 2014. In the example, ten situations with different stress levels occurred in this time frame. When looking at the levels and descriptions of the situations, the user makes the reflection that the period is characterized by recurring sleeping problems. In the example, the reflection is tagged as belonging to the stress area called "Sleep". This makes it possible to share the stress chart and self-reflection, and use it as a basis for conversations and group-reflections with other actors, both experts and peers, in the larger web-system. The user's own reflections can eventually be posted in the forum on sleep (for peers) and also referred to in conversations with the experts in the larger web-system.

Figure 4 shows an overview of the prototype with its different functions. To the left, a chart of past registered stress situations are seen. When clicking on one of the situations, detailed information about the situation appears. A description about the situation is seen below the chart, and it is possible to edit the text, if the user for example was not able to write so much at the time when the situation was registered. If the user has taken a picture in connection to the stress situation, this image is shown to the right, together with the geographical position. The reflections made by the

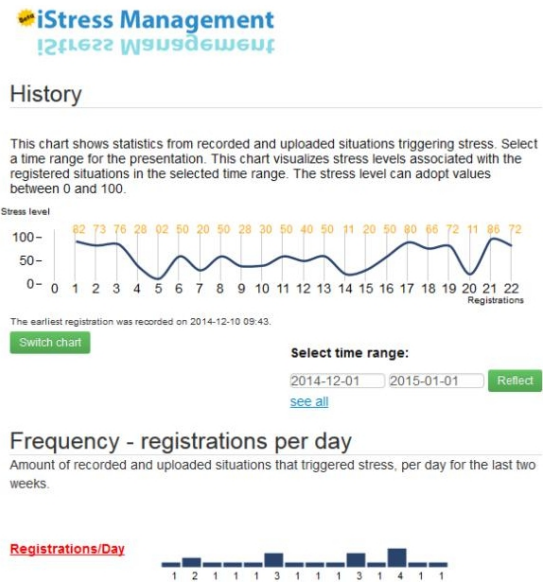


Figure 1: Interval of stress situations and stress levels.

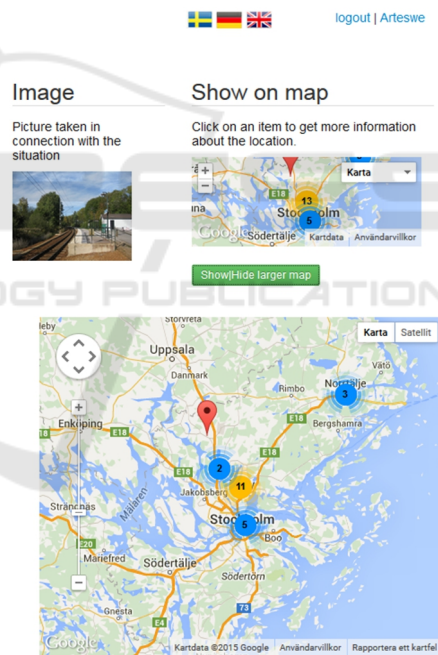


Figure 2: Stress situations in a geographical context.

user are seen to the right. Different themes and concerns can be seen in the list of reflections. Behind each reflection there is a certain stress situation or interval of stress situations. New reflections can also be added from here. Also, in order to work actively with managing the stress situations and to learn how to deal with them, the user can define goals (placed at the bottom), and there are also links to the larger web-based stress

management system where the user can engage in conversations with peers and experts, do exercises, read about research results, and so on.

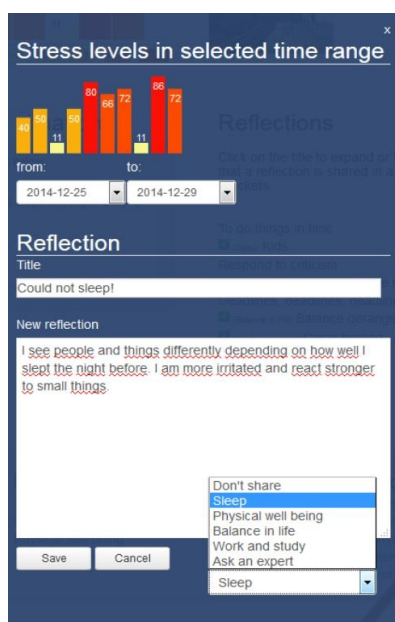


Figure 3: Sharing of reflections and stress diagram.

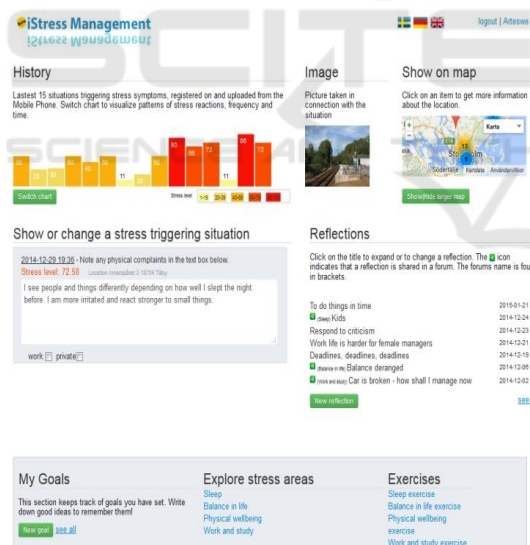


Figure 4: Prototype overview.

4.3 Technical Solution

The mobile phone app, developed earlier, is integrated with the prototype in the sense that it sends data to the prototype. Through scripting language (AngularJS) the logic could be handled, and HTML was used for the graphical presentations. The code is executed in a browser when it is actually

being used, and there are no requirements on the underlying platforms or software. The prototype can thus be used in all modern browsers and easily integrated with other systems. The coding work follows the recommendations from W3C. The idea was to have the technical solution as generic as possible to be able to easily integrate the surrounding systems. The prototype consists of the markup language HTML 5, style sheets (CSS) for the graphical presentation and a dynamic JavaScript based framework (AngularJS).

As data carrier between the mobile phone app and the prototype, JSON files were used. These are good for demonstrating the features of the prototype but will not be used in the final system. JSON files are platform independent and can easily be packed together with code and transferred between different environments. This makes it easy to further develop the prototype anywhere without losing functionality.

5 USER SCENARIO

This section presents a user scenario in which the system prototype for self-reflection and its relations with the surrounding systems for stress management are illustrated.

Linda, who is an employee at an insurance company, experiences stress reactions that she believes are related to her situation with the new job and her family duties. She downloads the mobile phone app for self-reflection on stress situations to her phone and surf around a bit on the related web-based system to get familiar with the systems. Some days later, Linda experiences symptoms of stress when facing a tough meeting with her boss. She grabs her phone and starts to describe the situation in a few words and saves it. The same evening at home, the kids are being very active and the stress level increases. Again, Linda records the situation in the phone.

A few hours later, Linda loads the data from her phone app to the web-based system. Uploaded data then appear as two registered situations. From here, Linda marks a situation as private and the other one as job-related. She also writes some brief notes about the physical symptoms that arose in connection with the job-related incident. Then, she compares the situations with each other and tries to reflect on the causes and effects.

In the beginning, there is not much data for analysis. But as the registered situations increase in number, the comparisons and visualizations of trends become more meaningful. Eventually, Linda checks the map to see how often situations have

occurred in different geographical contexts and decides to write a short reflection on a number of geographical context.

Linda recognizes also that the stress-related situations usually seem to occur at home and at work on the same day. She thinks it would be interesting to hear what others can tell about similar correlations. Linda decides to post a message in the forum "Balance in Life". But first, in the popup window where Linda wrote her reflection, she marks that she wants to share the reflection in the forum "Balance in Life". This means that the reflection together with the underlying stress diagram become available from the web-based system. When Linda formulates her question in the forum, the shared reflection is attached to the message.

Eventually, Linda gets a number of tips from users who have experienced similar situations. The answers help her relax since she understands that it is ok to feel the way she does and that she is not alone. She also gets some practical advice that she starts to practice. But some advice is difficult to understand, and she recalls that there is also a possibility to ask questions to a stress expert. Linda then formulates a question to the expert and shares this time a longer sequence of data from the past stress situations. The stress expert reconnects with some tips and explanations and also informs about an upcoming online chat session in which Linda is welcome to participate, if she wants to reflect together with others under the supervision of the expert.

6 CONCLUSIONS AND FUTURE WORK

In this paper, we have presented the design of a web-based prototype system that supports individual and social reflections for people with stress reactions. The interdisciplinary research that forms the basis of the prototype design was elaborated.

Visualization of events plays a central role in the design. It is manifested in the form of graphs presenting events in relation to each other, events over time, and the geographic locations of events. Previous studies have shown that visualization and evaluation of events that cause undesirable stress reactions provides a good support for reflections.

In the proposed solution, the user has also the option to specify whether an event is related either to a personal or a work-related situation. It has been shown in earlier research that people are more likely

to fail to cope with stress exposures when both areas are affected. This might result in a decrease in their wellbeing. Being more conscious of the different potential sources of conflicts in work and family life respectively can help individuals to find effective strategies.

Both individual reflections and social support have shown important for changing a negative trend of stress exposure as well as reactions to stressors. Therefore, the proposed system presented in this paper includes the possibility to share one's reflections, and also data sequences of stressful events, with others, both peers and medical experts.

The prototype presented in this paper is part of a larger online stress management system. It is integrated with both the mobile phone app where stress events first are documented, and the web-based system that allows the users to communicate, and to access information and exercises. All together, these integrated subsystems create a dynamic and combined online stress management platform, which could give individuals better opportunities to reduce mental problems due to stress exposure. The next step is to ensure technical robustness of the whole system. It is especially important in regard to security and integrity issues. So far, empirical evaluations have been restricted to students and during shorter time periods. Future empirical evaluations will include a larger group of employees who experience negative stress together with stress experts.

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