

# A Holistic Stress Intervention Online System

## - Designing for Self-help through Multiple Help

Åsa Smedberg

The Department of Computer and Systems Sciences  
Stockholm University  
Kista, Sweden  
asamed@dsv.su.se

Hélène Sandmark

School of Health, Care and Social Welfare  
Division of Public Health Sciences  
Mälardalen University  
Västerås, Sweden  
helene.sandmark@mdh.se

**Abstract**—E-health has undergone many changes during the years. One is the development of web-based self-help services for patients and citizens with health concerns. This article presents design ideas of a web-based stress intervention system that takes the development of self-help services further. The aim of the system is to help people with mild to intermediate levels of stress change patterns of behavior and take control of their stressful life situations. The system includes not only self-help through individual work with stress-related issues, but it also complements the individual efforts with help from peers and medical professionals. The system then becomes a platform for combining multiple help online. The system design ideas have resulted from research studies and practical experiences of stress management and web-based self-help systems. The article also presents a map of the system structure and a couple of scenarios to illustrate in what ways the system usage can be characterized by multiple help online and a holistic approach to stress intervention. The article ends with reflections on how to evaluate this type of intervention system.

**Keywords**-stress intervention; web-based; intervention online; self-help; multiple help; holistic; complementary support; communication.

### I. INTRODUCTION

E-health systems have evolved in many different health areas. Both patients with physical and mental conditions and citizens with health concerns, such as unhealthy lifestyles, use the Internet to search for information and seek help from medical professionals and peers. One area is self-help for people who experience unhealthy levels of stress and high stress responses. This article discusses the topic from a holistic perspective. Based on recent work [1], it demonstrates the design of a web-based system for stress intervention that integrates different complementary functions and actors.

Studies have shown that many people in working life are on sick leaves due to high levels of stress [2] [3]. In Sweden, stress related dysfunctions have become the second most common reason behind sickness absence [4]-[6]. By changing unhealthy lifestyles, people can reduce the risk of getting severe illnesses. Preventive healthcare and early interventions are therefore recognized as important in order to help groups of people from becoming patients of the healthcare system and

from being forced to sick leaves and long-term sickness absence.

Stress research has since a long time been oriented toward studies involving the physiological response (= the body's reaction) to stress and the cognitive processes that influence the perception of stress. However, the social perspective of the stress response has established that people with similar life conditions are not necessarily affected in the same way, which indicates that stress is caused, at least in part, by a person's mind or way of thinking. To change a certain way of thinking and to tackle an unhealthy behavior includes promotive and preventive interventions and an ongoing support [7] [8]. This is where the Internet and web-based systems can play an important role through available information of different kinds and continuous communication with others. Intervention systems need flexibility and to allow people to find their own ways through the system.

The use of self-management intervention systems on the Internet today is characterized by information management, interactivity and communication. However, the use of the different online health services for information and communication with experts and peers has not yet reached the level of integration and holistic thinking. The article addresses this gap. It introduces the design of a new type of web-based stress intervention system that considers integration, flexibility and individual differences. It includes different ways to approach stress, both from a stressor perspective (triggers) and a response perspective (stress reactions). However, the main focus is on the individual intervention. It also includes different sources of help, from research findings to real life stories, communication with peers and practical tools and counseling.

The article sections are organized as follows. To start with, background knowledge and understanding of stress, stress interventions and Internet self-help services will be presented. Thereafter, we will introduce our design of a new web-based stress intervention system based on a holistic approach using multiple help online. Examples of ways to use the system are illustrated through two scenarios. At the end, reflections on how to evaluate this type of intervention system will be presented.

## II. RELATED RESEARCH AND KNOWLEDGE

### A. Stress

The concept of stress is somewhat complicated as it is defined both as a stimulus, a life event, or a set of circumstances, as well as the physiologic and mental reactions. For the stimulus part, the exposure, the term *stressor* is often used, and the reactions are the *stress response*.

Hans Selye developed the concept of stress in a three-stage model of the body's response to stress [9]. He called this the General Adaptation Syndrome (GAS). The first phase is an *alarm reaction*, the second stage is *resistance or adaptation*, and the final stage is *exhaustion*. During the alarm stage the body responds to a stressor, which could be physical or mental. First the heart begins to beat fast and the release of adrenaline makes the individual alert and prepared to take precautions. Another response might include reactions in the stomach, a rise in the blood pressure, frequent breathing, dilation of the eyes, and a dry mouth. To help to meet the sudden danger (the stressor), the blood flows away from the organs that are not needed to confront the danger, to organs and tissues which are involved, for example, the heart, the eyes, and the muscles.

In the resistance stage of the stress reaction, the body is still ready to meet the stressful situation. If this part of the GAS is prolonged, the immune system might be heavily affected, and attenuated. In the final stage, the exhaustion stage, the body readjusts, and hormones are released to help bring the body back to normal, to a state of balance called *homeostasis*. Until this balance is reached, the release of hormones continues, ultimately suppressing the immune system.

According to the bio-psychosocial model of stress, it is stated that biological, psychological and social factors are linked in the progress of promoting health or causing disease [10]. In this model, the mind and the body are well connected and interdependent, which means that biological, psychological, and social issues operate together to affect the health status. The model is somewhat more comprehensive and could be considered a development of Selye's original model [9]. The stress response is elicited by a many different psychosocial stimuli which can threat the homeostasis, which is the ability to maintain internal equilibrium by adjusting its physiological processes. Stress is experienced negatively when this imbalance occurs between the individual's perceived demands and the ability to respond to these demands. In today's life the psychosocial stressors are the most common. To let a thought or an event be appraised as a stressor, there is a perceived mismatch between the demands and the individual's resources to cope with it [11].

### B. Work Stress

Stress among employees is a public health issue in modern working life. In the western world, there has been an increase in stress-related disorders and sleeping problems since the 1990-ties. It has been shown in scientific studies that the number of hours of overtime worked has increased. Work-related stress and overtime work has demonstrated

associations with altered physiological arousal, increased risk for stress related ill-health, lack of sleep, fatigue and impaired performance.

Also, intense lifestyles with job and also domestic demands let people experience high levels of long term stress exposures. Persistent ill-health, sometimes leading to long-term sickness and absence from work, can be a consequence of too high stress exposure during a long period of time.

Overcommitment at work could entail increased risk to experience work issues as stressful [12] [13]. Exposure to stressful job conditions such as very high workload, infrequent rest breaks, long work hours, shift work, and demanding interpersonal relationships, can certainly have a direct influence on workers' health.

### C. Stress Intervention

A healthy job situation is when the pressures on employees are appropriate in relation to their abilities and resources. It is also about control over one's work, and enough support. As health is not merely the absence of disease, but a positive state of physical, mental and social well-being [14], a healthy working environment is where there is not only an absence of harmful conditions but also health-promoting circumstances. The concept of the health promoting workplace can ensure a flexible and dynamic balance between the co-workers' expectations and the organizational targets and also the employees' skills and health improvements.

In stress intervention, empowerment is a central concept. The strategies can be concluded as the processes leading to increased stress management and better health in different populations and groups of people. Empowerment helps people to increase control and manage their lives according to their needs and preferences. The key question is how to build on and reinforce authentic participation ensuring autonomy, feelings of value and sense of mastery in decision-making. Learning and problem solving abilities are important assets for any organization or work site wishing to reach its full potential, and empowerment within the individual stimulates job satisfaction. The educational approach to stress management is concerned to enable people to make informed choices, set limits, and increase coping ability. The preventive and promotive approach are aimed to achieve behavior changes: Internal locus of control is a key factor in efforts to create empowered environments and empowered individuals able to meet stressors at work and in private life [15] [16].

### D. Evidence for Behavior Change Methods

The management of health-related problems is a question of behavioral change, whether it is via the Internet or face-to-face appointments. Individuals usually have to engage in changing their lifestyles for example, to be more physically active or use self-management to improve their health problems.

There are many behavior modification methods [17] [18]. In a meta-analysis of changing health behaviors via the Internet, it was concluded that included studies reported a large number of behavior change methods [19]. The mostly

used behavior modification methods were to provide information of the consequences of a behavior in general terms, self-monitoring of behavior, and identification of barriers and facilitators for behavior. Methods that yielded the largest treatment effect sizes were stress management and training of communication skills. Observational learning, relapse prevention and problem-solving plan, goal setting, action planning and feedback all had significant positive effects [19]. It has been concluded that treatment including self-monitoring of the behavior with techniques including intention formulation, goal-setting, feedback on the performance, and review of goals, was at least partially more effective than behavior modification treatment without these techniques. This was concluded in a meta-regression analysis of behavioral change studies to increase healthy eating and physical activity [20].

#### *E. Self-Help and Different Actors Online*

There are different types of self-help services on the Internet today for people with lifestyle issues such as stressful lives. One is the Ask-the-Expert service that lets users post questions directly to the system to be answered by an expert, and the users can also choose to browse the system for stored questions and answers [21]. This function in the e-health area is believed to offer value to people who need to gain new health knowledge and guidance [22]. The users can get health recommendations and advice from medical experts [23], health service that is also recognized to offer a new type of continuous relationships with medical experts [24].

Another self-help service on the Internet is the community forum systems for peers. These community forums on health issues have become popular lately and are used regularly by patients and citizens with different physical and mental conditions [25]. These systems let people share experiences and offer each other advice on how to cope with different health concerns [26] [27]. Research shows that patients online tend to be well informed today, and that they act both as producers and consumers of health information [28]. This blur between being a producer and a consumer of health information and services is also named 'prosumption' and the user a 'prosumer' (e.g., [29] [30]). The online self-help groups have also shown to enhance decision-making skills for people who are in distress, and to foster well-being, a sense of control and self-confidence to manage situations [31].

When web-based community conversations for peers have been compared to published questions and answers in the Ask-the-Expert service on lifestyle problems, the two types of help services were shown to offer the users complementary contents and knowledge [32] [33]. Advice and information given in the two types of systems were seen to be of different characteristics, allowing people with lifestyle problems to get diverse and complementary views of their problems. While answers from health experts were characterized by detailed descriptions of health subjects, the peer conversations emphasized personal experiences and more practically oriented advice. By linking the different answers – the ones from health experts and the ones from peers in community conversations – the users are assumed to benefit more [32].

This leads us to believe that a combination of different types of health services and actors in the stress management area would help people with mild to intermediate levels of stress problems change patterns of behavior and take control of their stressful lives. To integrate knowledge and experiences of medical professionals and peers is believed to make an advantage.

Many people who suffer from stress related disorders prefer to get interventions through the Internet, and studies have also shown positive effects on health outcomes. There is evidence that Internet-based treatment with CBT (cognitive behavioral therapy) for depression and panic disorders in psychiatric care can be efficient. The Internet treatment is effective in reducing symptoms of depression and panic disorders [34]. It also makes psychological treatment more accessible.

A systematic review was done of 12 studies in which cognitive behavioral therapy for different health problems was administered via the Internet [35]. The quality of the studies was variable as well as the content of treatment program. Advice for self-care with or without telephone or e-mail support was used. Most treatments included education and training on specific health problem, restructuring of thoughts, relaxation techniques, and training of social skills. The studies showed a limited to large effect compared with the control group that often consisted of patients on a waiting list [35].

However, there are probably high rates of drop-outs [36] [37]. There is also little known about the participants' use of the web-based stress intervention programs, what the communication patterns are like, and what support the participants take advantage of. How to make use of technological possibilities and human resources in this field needs to be further explored.

### III. DESIGNING A HOLISTIC STRESS INTERVENTION SYSTEM

#### *A. Multiple Help Online – Five Types of Help*

The system for stress intervention online that we propose is designed as to form a whole of different help services and actors who contribute together. The system consists of five types of help: Ask-the-Expert, Counseling room, Community forum, Exercise programs and Stories told & research results. Below, the basic characteristics of each of these five are described.

##### *1) Ask-the-Expert*

Ask-the-Expert is where the user can ask medical professionals for help and advice on different stress related concerns. This type of help can be used both for direct questions and also for browsing for previously popped questions and their answers (FAQs). This part of the system is based on textual communication between one user and a medical expert. The user gets a personal answer to his or her question through e-mail. When making both question and answer (FAQ) public, the question is made anonymous, and any personal information is reduced. The process of making

them public is handled by the health expert, who also ensures that necessary editorial changes are made.

### 2) *Counseling Room*

The counseling room is a chat area in which users and medical professionals can meet in smaller group sessions. The counseling room is based on synchronous communication among the participants. Different predefined topics related to stress management can be addressed during these sessions. Cognitive behavioral therapy for stress management addresses topics such as excessive job involvement, low self-esteem, lack of recuperation, work-family imbalance, job mobility and competence matching.

If the user clicks on one of the scheduled counseling sessions, information about the counseling session is shown, such as time of session, theme of the session, health moderator, and if there is room left for more participants. The user can choose to sign up for the session, if the group limit is not exceeded. At the time of session, the user joins the session chat.

### 3) *Community Forum*

Communication between peers is also important for keeping up with ongoing stress interventions. Community forum lets the users have conversations together on current topics in their daily lives, related to sleep, work situation or balance between work and family, for example. The forum is based on asynchronous communication, and communication can therefore take place whenever the users have the need for it. The community normally needs a moderator, but the role of the moderator differs from the one in the counseling room. The community conversations will not be steered by the moderator in the same way; instead the main role of the moderator will be to monitor the conversations and interfere only if negative online behavior occurs or if advice is given that is believed to cause harm to the user.

The web communication with peers can help people get new insights and encouragement to develop and maintain new habits. It supports the idea of ongoing social support as an important means for dealing with new habits.

### 4) *Exercise Programs*

The fourth help service of the system is the exercise programs. Depending on the stress issue, there are different available exercises that the users can do on their own. Reflection exercises on work or study situation, relaxation techniques and abdominal breathing exercises to ease physical tensions are examples. The exercises are presented in textual, audio and video format, depending on the purpose of the exercise.

Below is an example of video demonstration of a relaxation exercise (see Fig. 1). The video demonstration illustrates how one can perform the exercise while sitting on one's office chair at work. The exercise in the example takes only a few minutes.



Figure 1. Example of a video-demonstrated exercise

### 5) *Stories Told & Research Results*

The last function of the system is about giving the users access to stress-related research results and real-life stories told by others who are, or have been, in similar situations. This part of the system is mainly based on storage and retrieval of textual information, but can also be illustrated in the form of audio recordings. By letting the users access other people's real-life stories together with the comments and advice from medical professionals, the users can learn to see their own situations clearer. It also aims at helping to reduce stigmatization.

#### B. *Stress Intervention Areas*

The holistic design is also based on a set of interrelated stress intervention areas. There are different areas that need to be addressed in order to ease the stress levels of the users. The system's multiple help is therefore structured in accordance with four main stress intervention areas: sleep, work/studies, balance in life and physical wellbeing. A mockup design of this structure is seen on next page (see Fig. 2). The stress intervention areas are introduced in the following sub sections.

#### 1) *Sleep*

It has been concluded that stress is strongly linked to disturbed sleep, insomnia and impaired awakening. The inability to relax and to let work issues act as stressors is probably an important link in the relation between stress and sleep. The quality of sleep has thus shown to be of great importance for the onset of stress-related dysfunctions as well as the recovery. It is therefore an impending risk that a person with high levels of stress ends up in a negative loop of increased sleeping disturbances and high level of stress. Assessments of sleeping quality and insomnia and exposure to stress as well as the effects of interventions need to be further investigated.

#### 2) *Work/Studies*

An overcommitment at work could entail increased risk to experience work issues as stressful [12] [13]. Exposure to stressful job conditions such as heavy workload, infrequent rest breaks, long work hours, shift work, and interpersonal relationships, can certainly have a direct influence on workers' health. Overcommitted co-workers often suffer from inappropriate perceptions of demands and fail in their coping

## Stress Intervention A System for Multiple Help Online

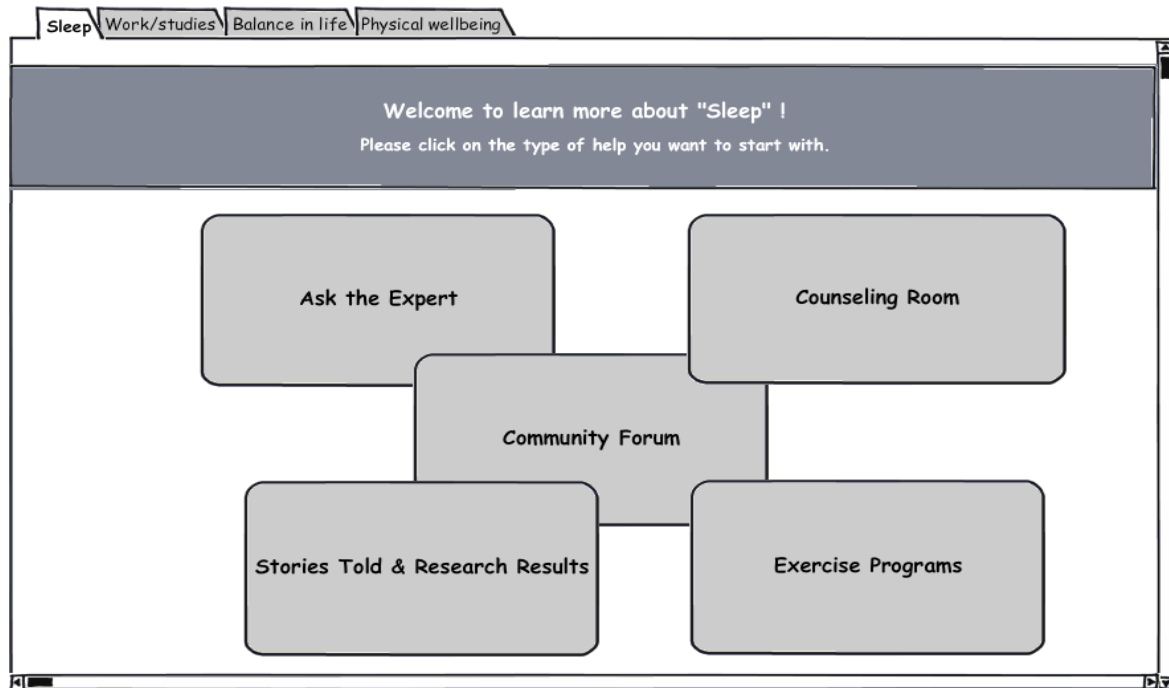


Figure 2. Mockup design of the stress intervention system showing the multiple help functions and stress intervention areas.

ability. Also, perfectionists have been described as people who are highly responsive to stress, and they tend to generate extensive stress for themselves [38]. Concern over mistakes and automatic thoughts of perfectionism are examples of things that can increase the level of stress.

Both work and studies nowadays include a great amount of flexibility and ability to stay connected independently of time and space. In general, this is a positive development since it allows for distance work and studies. But at the same time it increases the risk of having more people ending up in active work and study lives without boundaries. To be able to negotiate about expectations regarding availability, and to set limits, are important for a healthy work and study life [39].

### 3) *Balance in Life*

Stressors related to occupational work such as a frustrating work situation or a work-family imbalance are often major causes of strain, and mental ill-health, as well as psychosomatic conditions [5] [40]. Especially job strain with exposure to stressful job conditions could certainly be a health hazard to those who have additional strain from family life. Perceptual distortion can prevent people from accurately assess cost-gain relations and to set limits [12].

### 4) *Physical Wellbeing*

Responses to stress are often manifested in body tension. Regarding individual interventions in the area of dysfunction due to negative stress exposure, progressive muscle relaxation was originally designed by Jacobson to guide people through successive tensing and relaxation of the body muscle groups

from toe to head to achieve overall body relaxation [41]. This process is easy to learn and teach, safe, non-threatening and non-competitive. Since then it has been concluded that the effectiveness of the interventions varied according to the health-outcome measure used. Cognitive-behavioral skills were more effective for psychological outcomes, whereas muscle relaxation techniques were more effective for physiological outcomes. Using a combination of techniques; muscle relaxation and cognitive-behavioral skills seemed to be more effective across outcome measures than using a single technique. Deep, diaphragmatic breathing is known to counteract the fight or flight response symptoms that are often associated with anxiety and negative reactions on stress exposure. Also meditation can be used to counteract stressful situations, as it is a technique to develop concentration and awareness to produce a calming effect. Here, diaphragmatic breathing is central to any meditation practice. It has been found that there could be a lowering of blood pressure during deep breathing, which is interesting to consider in stress management [41]-[44].

### C. *A Holistic Design with Multiple Help Integration*

The stress intervention system proposed in this article applies the concept of multiple help online for different stress intervention areas. From this, it follows that peer conversations, questions to as well as answers from medical experts, counseling sessions, research results, life stories and exercises are available in each of the stress intervention areas. The system also focuses on keeping it together, allowing the

different parts to be linked together. This idea is rooted in systems thinking.

In systems thinking, not only the separate objects of the system but also the relations between the objects play an important role for the system [45]. Even though we cannot determine the output from a certain input in complex systems, there are certainly connections that make the subsystems affect the performance of each other. The holistic properties of a system are based on the subsystems working together as to form a whole [45] [46]. A way to categorize relations is to look at the way they affect the involved subsystems. Symbiotic relationships are necessary for either one or both of the connected subsystems to function. Synergistic relationships are not functionally crucial, but they increase the levels of performance for the involved subsystems. Without the connection between the subsystems, the sum of their individual performances would not reach the same level as if they work together in combined actions, i.e., the whole is larger than the sum of the separated parts. There are also redundant relations, a sort of relations used to improve reliability of a system.

The web-based stress intervention system proposed in this article takes a stand point in holistic and systems thinking. The different stress intervention areas aim at letting the user choose his or her way into the system based on what is believed to be the most urgent stress-related concern. At the same time, it is important to offer easy ways to navigate between the different intervention areas. The technical system can assist in this through links and navigation menus, but also the medical professionals engaged in the online system, as well as the peers, can support this by referring to other intervention areas. In a conversation on sleep, for example, there could be references to related conversations on work issues within the work/studies intervention area.

The same idea is applied to the five types of help in the multiple help concept. The different help services are linked together so that the users can navigate easy between them, but also the medical professionals can encourage the users to take advantage of other help services for complementary support and knowledge. In the Ask-the-Expert answers, there can be references to relevant peer conversations that the user could join, for example. This is implemented manually to start with, by having the medical expert suggesting peer conversations in his or her answer. In a future setting, it is also possible to implement automatic matching techniques in order to generate links to similar stress-related topics in different parts of the system.

All the links that are created between stress intervention areas and types of help contribute to the idea of holistic and systems thinking.

#### D. System Structure and Navigation

The system is structured in a way as to make navigation easy. When entering the system, the four stress intervention areas are seen. For each one of these areas, the five help services are displayed and accessible. The user can then choose to focus on one stress intervention area and activate the

different help services to learn about the specific area from different perspectives and from different online actors. An illustration of the structure of the system can be seen in the figure below (see Fig. 3).

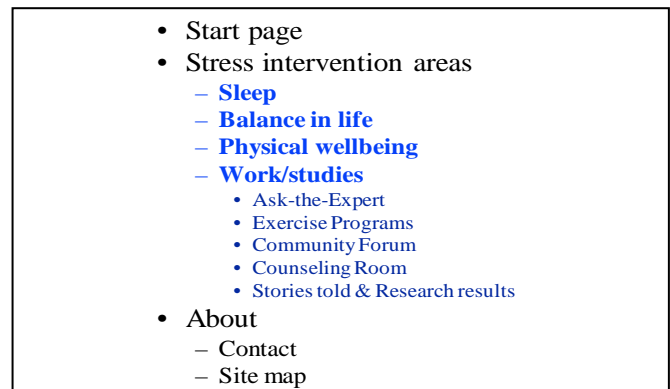


Figure 3. Map of the stress intervention system when the intervention area Work/studies has been expanded.

The system structure aims to let the users navigate easily between the different help services. It also supports navigation between the stress intervention areas. When activating a help service, such as the Ask-the-Expert in the area of work/studies, FAQs can be searched for and new questions to the medical professionals posted. What is also possible for the user to do is to navigate from here to FAQs in other stress intervention areas. Figure 4 illustrates this.

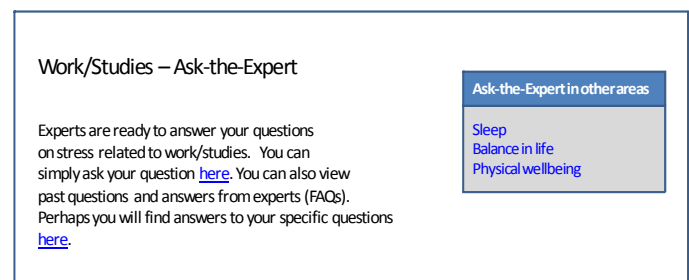


Figure 4. Example of design for navigation: Connecting Ask-the-Expert services.

## IV. SCENARIOS

Below, there are two short examples of scenarios aiming to illustrate in what ways the web-based stress intervention system can be used to let the different stress areas, information sources, tools and actors work together.

### A. Scenario 1: Chain of Complementary Support

Eve, 52 years, is a middle manager in a company. She is ambitious and has always felt that people around her have high demands on her. Today, her employees and family take almost all her time, which has led to a stressful life situation with too little sleep and unhealthy food and exercise habits.

Eve enters the stress intervention system by visiting the stress intervention area for balance in life and its community

forum for peers. She finds a conversation that is ongoing, on a theme close to her own situation. She reads the conversation for a while, and then adds a posting telling the others that she finds it difficult to make room for herself and her needs. The conversation continues with the problem of saying no and to delegate responsibilities. One peer recommends Eve and the others to sign up for an online counseling session on how to set limits. Eve signs up, and later she joins the counseling session together with a handful of peers, moderated by a medical professional. During the session, the medical professional refers to an exercise on how to practice limit settings present in the help service for exercise programs. When Eve has practiced some of the exercises on setting limits, she wants to spend some time doing physical training exercises. Therefore, she visits the exercise programs in the stress intervention area for physical wellbeing. She also starts to participate in the online conversations on physical wellbeing, to get advice from peers regarding where to buy price worthy shoes and other equipment for training activities.

The combination of different help services as described in the scenario can contribute to a better understanding of the current situation, and what to do, than if only one of the help services was used. Since the different types of services offer different knowledge and advice, they complement each other. In the scenario described, the expert contributes with medical insights and knowledge of what exercises that could be beneficiary to perform and the peers contribute with their own experiences and practical advice regarding sports equipment, for example.

The described scenario path through the system can also be seen in the figure below (see Fig. 5).

Intervention Area / Help Service	Sleep	Work/studies	Balance in life	Physical wellbeing
Ask-the-expert				
Counseling room				
Community forum				
Exercise Programs				
Stories told & Research results				

Figure 5. Example of scenario path (scenario1)

**B. Scenario 2: Complementary Stress Intervention Areas**

Johan is a 37-year old man who works with systems analysis at a big IT-company. He works very long hours in front of his computer. His back has started to hurt, and his body is stiff and his eyes dry. Recently, his sleep has been affected as well. He finds it difficult to fall asleep and he often wakes up at night.

The first thing Johan does when entering the stress intervention system is to open the intervention area for issues about sleep. He starts to search for similar issues among the

FAQs in the Ask-the-Expert service to find out about what he can do to ease his sleeping problems. Eventually, he posts a question. The medical expert who answers the question from Johan presents some practical advice on how to relax before going to bed. The expert recommends Johan to have a look at the video instructions for relaxation available in the system’s exercise programs service. But, since Johan has several concerns, the expert also recommends exercises that Johan can do at work, both to increase the variety of physical work activities when using the computer and to reduce strain on the eyes. These exercises are found in the stress intervention area for work/studies. The medical expert also recommends Johan to visit the stress intervention area for issues related to balance in life, to read about research results and to join conversations with peers on how to make room for other activities besides work.

This scenario had its focus on the complementary stress intervention areas. It showed how the three areas, “sleep” “work/studies” and “balance in life”, worked together to help Johan gain new insights into how to handle his upcoming health problems.

This scenario path of complementary stress intervention areas can also be seen in the figure below (see Fig. 6).

Intervention Area / Help Service	Sleep	Work/studies	Balance in life	Physical wellbeing
Ask-the-expert				
Counseling room				
Community forum				
Exercise Programs				
Stories told & Research results				

Figure 6. Example of scenario path (scenario2)

**V. EVALUATION OF THE STRESS INTERVENTION SYSTEM**

The web-based stress intervention system proposed in this article is flexible and uses present human resources for the stress interventions; both the users with stress symptoms and the medical expertise contribute with their knowledge and experiences. In what ways they contribute depends to a large extent on their communication about stress-related issues. We have also discussed the individual approach to the system by illustrating how the users with stress-related symptoms are encouraged to move between the different system parts based on their individual needs.

From these characteristics of the web-based system follows that the contents of the system is dynamic, and so are also the online interventions. To evaluate this kind of system demands for a new way of thinking.

Evaluation has to be based on established evaluation questionnaires for self-evaluation of participants’ health status (e.g., [47] [48]), but, it needs also to target the actual usage of

the system and the individual opinions and experiences of using the system. The actual usage of the system can be evaluated through observations and analyses of logged online activities, such as the social activities in terms of number of answers to posted questions and answers expressing empathy [27]. Different analyses of patterns of posted questions and answers will give valuable information about online activities. Furthermore, we need to learn what kind of questions the users with stress symptoms ask, the way they respond to each other by giving advice and different opinions, the contents of their advice, etc. [32] [33] [49]. In addition, the evaluation questionnaire about the participants' health status needs to be complemented by a questionnaire about their experiences of the system.

## VI. CONCLUSION AND FUTURE WORK

This article has outlined some basic foundation of a new and holistic web-based system for stress intervention. The novelty of the system lies in the holistic approach considering both different aspects of stress and stress intervention and also different supportive roles and functions. Not only have attention been drawn to self-help through information access and exercises, but also to the necessity of having support and guidance from peers and medical professionals to ease the individual struggle for sustainable new habits and improved health. To make the system holistic, web links between the different intervention areas and also between the different kinds of help are considered. Additionally, the medical professionals and other actors in the system can amplify the holistic view of the system by making references to different system parts. This will let the user navigate more easily between the different parts of the system and to use different kinds of help in combination.

Next step is to have the system design fully implemented and tested. It is to be evaluated by a test group of white-collar workers with stress symptoms. Research studies will be conducted on their system usage, such as their online communication behaviors, their experiences of the system and their health status at different times during and after the intervention.

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