Understanding information practices in an e-health intervention. The case of preventing cardiovascular diseases in northern Finland

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The findings from a case study conducted to increase understanding of health-related everyday life information behavior in the context of an e-health intervention to preventing cardiovascular diseases are reported. The theoretical framework combines the concepts of information behavior and practices and related factors. The data, consisting of semi-structured interviews of five intervention participants', were content analyzed. The findings indicate that the practices of information seeking, use, and sharing were acted upon in the intervention. Information sharing emerged as an important practice and was actualized in Skype meetings. Skype was considered to be advantageous for information sharing, while the web learning environment was perceived merely as information storage. The study was small-scaled with obvious limitations. However, the findings provide the viewpoint of an intervention’s participants in a real-life context. This information can be useful in designing future research focusing on a more detailed examination of how information provision may have an impact on people’s health behavior.

Keywords
e-health interventions, health behavior, health information, information practices, qualitative approach

1. Introduction

Cardiovascular diseases (CVD), inflicted by disorders of the heart and blood vessels, caused 34% of all deaths globally and 40% in Finland in the mid-2000s [1, 2]. A number of health-related behaviors practiced by people in their everyday lives, such as tobacco use, physical inactivity, and an unhealthy diet, are known to influence the onset of the diseases [3]. Thus, the emphasis on preventing CVD is on modifying people’s health behavior. Health behavior can be positively affected by preventive health care and health promotion [1], though the evidence on the effectiveness of health promotion methods is ambiguous and contradictory [4]. Health promotion and disease prevention are studied in many fields of science from different angles. For example, biomedicine seeks to prevent diseases and affect physical health risks, whereas educational science aims at changing health behavior through education. A multidisciplinary approach in which the views of biomedical, behavioral, educational, and nursing sciences are combined is often applied to provide a sufficient knowledge base. [5] The study reported in this paper is based on the viewpoint of information studies (IS).

The overall aim of the study was to increase understanding of health-related everyday life information behavior in the context of an e-health intervention. The objectives were: to depict the participants’ health-related information practices in an e-health intervention aimed at preventing cardiovascular diseases in northern Finland; to assess the feasibility of the ICT applications used in this intervention; and to describe the participants’ experiences of changes in their everyday life health behavior after the intervention. The research questions were stated as follows:

1. What information practices can be identified in the context of an e-health-intervention?
2. How have the participants experienced the use of the ICT applications of the e-health intervention?
3. What changes have the participants experienced during and after the intervention?

The research strategy was qualitative and contextualized in individuals’ everyday life information behavior. This is a rare approach to examining e-health interventions [6-8]. Theoretically the study was based on the ideas of constructivism, defined as the view in which an individual mind constructs...
reality, but within a systematic relationship to the external world [9]. In IS this view is also referred to as "the cognitive viewpoint" [10]. The concepts of information behavior [11] and information horizon [12] rise from this viewpoint. According to Sonnenwald [12], from this perspective information behavior is seen to be influenced by cognitive, affective, and contextual factors. In the framework of the study, the concept of information behavior is integrated with the concept of information practices, namely, information seeking as identified by McKenzie [13], and information use and information sharing as identified by Savolainen [14]. These concepts, in turn, are based on social constructionism, which emphasizes discourse [9] in which knowledge and identities are constructed [10]. All these concepts were further combined with individuals’ health-related skills, health knowledge, health literacy, and health behavior. (See Figure 1.)

2. Health information and its impact on health behavior

2.1 Health education, interventions, e-health

Health education is defined as a process where people learn how to take care of their own and other people’s health [15]. It provides opportunities for learning and involves communication designed to improve health literacy which includes health knowledge and health-related skills. Education is concerned with communication of information and fostering of the motivation, skills, and confidence (self-efficacy) necessary to improve health. [16.] From the viewpoint of constructivism, the purpose of education can be considered as helping the individual to construct his or her own health-related meanings, not just memorizing the “correct” answers provided by the educator [17].

Health education can aim at promoting and maintaining healthy behavior or preventing and treating diseases. It can be delivered through interventions conducted in various contexts. Developing ICT applications for this purpose is becoming common and is referred to as telemedicine, telehealth, and e-health [18]. In this paper the concept of e-health is used and understood as the use of ICT as a tool of health promotion.

The Internet has enabled utilization of voice-over-Internet software, videoconference applications, and e-learning environments as tools for e-health interventions to extend the reach of delivery [6]. It enables combining the characteristics of face-to-face counseling with a mass communication approach to health education to increase the intensity of interventions [19]. Web-based interventions are promising, though their effectiveness is considered ambiguous [20, 21] and more research on the feasibility of applications is needed [22]. Typically, e-health interventions are evaluated with the help of biological and clinical indicators, and although effects are detected, it is difficult to determine what caused the participants’ behavioral changes [19]. Glasgow [6] claims that qualitative measures should be considered in intervention studies. Some qualitative e-health studies focusing on the user experience have been conducted before. For example, Kerr et al. [8] used focus groups to determine user-generated criteria for assessing the quality of interactive health communication applications or e-health interventions, and Nordfeldt et al. [23] qualitatively explored users’ attitudes toward a Web 2.0 portal tailored to young patients with diabetes and their parents. However, a qualitative approach is rare in e-health studies.

2.2 Health information and health behavior

A positive correlation between education and good health has been found in prior research. This is explained by improved knowledge of the relationship between health behavior and health outcomes, which leads to healthier behavior. [24.] Health promotion and interventions are usually designed to increase individuals’ health knowledge and improve skills, to change attitudes, or to apply self-management strategies [19]. However, improved knowledge does not automatically lead to improved health behavior [25, 26]. Also, those who seek health information most frequently do not necessarily behave any healthier than those who seek health information less often [27].

In constructivism, it is presumed that an individual’s prior knowledge and experiences play a significant role in learning [17]. Thus, the way people take advantage of the information provided depends heavily upon their prior knowledge. This partly explains why health promotion often fails to
achieve its goals. The concepts of information literacy and health literacy are used to explain the fact that people's need for health information and their ability to benefit from it differ in society [26, 27]. Information literacy refers to a personal capacity that promotes information seeking, evaluation, and use. Respectively, health literacy is referred to as the capacity that promotes health information seeking, evaluation, and use. Health literacy represents the cognitive and social skills that determine individuals' motivation and ability to receive, understand, and use information in a health-promoting way. [5, 28.]

The concepts of information and health literacy are associated with the growing amount of information available. Kickbush [29] claims that information overload is often most prevalent in the basic areas of health, such as exercise, nutrition, sleep, and stress control. People daily receive a vast amount of health-related messages from a variety of sources and also proactively seek information. Too much information can hinder understanding health issues and making well-advised decisions based on received information. According to the theory of sense of coherence by Antonovsky [30], complex messages increase the potential of confusion. A high sense of coherence is associated with perceived health, social support, and information literacy [26].

2.3 E-health applications in providing health information and social support

People's different needs for health information and abilities to benefit from it can be taken into account in health promotion and education. Both can aim at improving the level of individuals' health literacy, but also at improving the communication skills of health professionals or the readability of systems. [29]. Interactivity can be considered a key feature that makes the Internet a powerful health communication tool [31]. According to Lustria [31], interactivity contributes to the persuasive capabilities of health communication and can affect comprehension and attitudes toward e-health applications.

Targeting of information to a population subgroup whose members share the same characteristics, or tailoring of information to meet the needs of a specific individual, are methods used in e-health interventions to increase the impact of information and the effectiveness of interventions [21]. For example, in an intervention aiming at smoking abstinence, highly tailored success stories and highly personalized messages were found to relate more to abstinence than outcome expectations, efficacy expectations, or the amount of exposure to intervention materials [32, 19].

Individuals might also benefit from communicating with other people in the same situation or tackling with the same kind of problems. Information about one's own experiences can be shared and discussed in peer groups [33, 34]. Support from peers can help motivate someone to maintain positive health behavior [35], and this can be utilized in an intervention. However, providing an opportunity for this does not necessarily lead to support [36]. Also other interactive tools, such as health assessment or self-report tools and electronic nutrition or exercise logs can be used in e-health interventions to help enhance a change in the behavior of individuals.

2.4 Health behavior change and everyday life information behavior

It is difficult to show causal mechanisms for changes in health behavior [19]. Often a theory or a theoretical model, such as the social cognitive theory, social ecologic model, theory of reasoned action, or transtheoretical model, is applied in an intervention [21]. Moreover, behavioral change can be seen as a teaching and learning process related to pedagogic use of ICT in e-health interventions. In communication studies, media are seen to have a significant influence on individual behavior, including health behavior. These influences are commonly divided into cognitive, affective, and behavioral effects [36]. In information studies Niemelä [38] has described the effect of media or other information sources on behavior with the concept of enactment.

The theoretical framework of this study (see Figure 1) is built upon the three health-related information practices, namely, information seeking, use, and sharing. These practices are examined in relation to people's health information behavior as a part of their everyday life information behavior, affected by contextual and individual factors.
Information seeking occurs in an individual’s perceived information environment [14], which covers the information sources and channels he/she is aware of. The information source horizon [14, 12] refers to the sources the individual selects or encounters in a certain context. From these sources the individual can receive information and use it. Information seeking practices are divided into active seeking, active scanning, non-directed monitoring, and obtaining information by proxy [13]. Information sharing can occur when information is given to or received from others. Information use may affect health knowledge and health-related skills. It relates to the concept of health literacy, referring to the ability to utilize different health information sources and make reasonable health-related decisions. These factors may have an impact on health behavior: choices related to nutrition and exercise, for example. Information use and health behavior can be further examined through the concept of enactment, referring to the concrete actions an individual engages in after receiving information from an information source [38].

3. The empirical study
3.1 Research method and material

The empirical data were collected in a Finnish intervention trial that was conducted between the years 2007 and 2009. The intervention aimed at promoting heart and vascular health, preventing cardiovascular diseases, and developing new policies for e-health interventions. It also sought to diminish Finland’s regional inequality in the quality and accessibility of health care and reduce health disparities between regions. The means were health counseling provided by health professionals in group meetings using voice-over-Internet software application Skype and a web-based learning environment for information provision and communication. The information delivered in the intervention can be considered targeted, as the information was designed to meet the needs of a group that shared similar characteristics (age, habitual residence, and risk factors of CVD).

Of the 22 municipalities in the Province of Lapland, nine participated in the study. All 40-year-old inhabitants (n = 571) of these nine municipalities were invited to a screening. Additionally, in some cases also 39- and 41-year-olds were invited, because there were only a few exactly 40-year-old inhabitants in the smallest municipalities. Finally, 286 persons participated in the physiological measurements of body weight, waistline measure, blood pressure, cholesterol, and triglyceride levels. They also filled in questionnaires about their lifestyle, commitment to the intervention, and a diabetes risk test. Of these, 98 persons were classified into the risk group for cardiovascular diseases, and 76 of them accepted offered counseling. After a dropout of 20 persons, a total of 56 inhabitants of the 22 municipalities participated in the intervention.

The intervention covered eight group meetings in Skype, access to the web learning environment, and follow-ups after six and twelve months. The duration of the Skype group meetings with the counselors was approximately an hour and from four to seven participants attended these meetings at a time. A certain theme was discussed at each meeting and some homework was done prior to it. The participants were advised to read information (on heart health, healthy eating, exercise, mental health, sleep, stress, tobacco and alcohol use) and to use self-assessment tools in the web learning environment. Also printed material was mailed to them. The measurements and inquiries were repeated in the follow-ups. Exercise and diet logs were kept, and self-reports of waist measurements and weight were e-mailed to the counselors after two, four, eight, and ten months from the scanning.

The data collection for this study was based on a qualitative research strategy that included interviews, observations, documents, and discussions, with interviews being the main method of data collection. A request for an interview was sent via the health professionals after the intervention. Finally, five participants (three men, two women) were interviewed by using a semi-structured interview guide and Skype software and HarddiskOgg software for recording, between April and August 2009. The themes were set on the basis of the documents and observations as follows:

- health knowledge
- the content of the intervention
- the impact of the intervention
- health behavior
- use of technology in the intervention.

The interview guide was sent to the interviewees prior to the interview. It was accompanied by an information source horizon picture [39] to be filled in. The duration of the interviews ranged from 55.3 minutes to 99.5 minutes, the average length being 72.4 minutes.

The data were transcribed and analyzed with qualitative content analysis techniques. The analysis was theory-driven. Although the theoretical framework supported the analysis, the units were extracted from the data. The enquiry did not attempt to generalizes, but to discover common characteristics and disparities in the data. The data were aggregated into three categories: 1) the information practices of the intervention participants, 2) the content of the intervention and the use of ICT in it, and 3) the changes experienced during and after the intervention and the factors inhibiting them. The extracts from the data used in reporting the findings were translated by the first author of this paper and checked by a native speaker.
4. Findings

4.1 Information practices in the context of the intervention

The information practices related to the information seeking, use and sharing of the intervention participants were examined by analyzing the interview data. The participants had obtained health information during the intervention through the practices of information seeking from counseling, the web learning environment, printed material, and the peer group. The practices of active scanning and obtaining information by proxy were most common, and especially obtaining nutrition information was mentioned in the context of the intervention.

However, the intervention was not described that much as a source of new information, but rather as a reminder of things already known: “It’s like I have known these things but now they came to the surface more (I4).” General health information was not perceived as particularly significant to motivating choices related to health behavior or health behavior change:

“It’s really something you basically already know. Like considering this project, what came across. There isn’t any new information, it’s just like: remember this.” (I1)

“I can not say I learned anything, but some things came back to mind.” (H3)

“If I could just pull myself together. I have the information about losing weight, so I do not need that.” (I5)

The participants also received information about their own health and health behavior through self-assessment tools in the web learning environment, physiological measurements, and exercise and diet logs. They perceived this information as important and it had increased their awareness of health and health behavior: “You just pay more attention to it… Like when this exercise log came, I felt like “oh no” when I saw it on paper. Days go by and you realize you haven’t even gone out for days.” (I1)

In this paper information use refers to the concepts of learning and enactment as they are applied to describe the phenomena that emerged during the analysis. Learning was a concept that emerged when the interviewees were asked about the use or impact of health information. Typically the interviewees described learning experiences that had taken place over a long period of time. For example, a change in attitude was described as learning: “It is like change in attitude. That you start to think the way you should have though.” (I1)

Activities that can be understood as enactment [38] came across in relation to media use in general and the intervention in particular. Enactment occurred when the intervention participants used exercise and nutrition logs and also when they communicated with the peer group. The participants had paid attention to their own health and health behavior especially with the help of the logs and self-assessment tools. Enactment-related behavior also emerged after filling in these logs or using the tools: “I just realized how much I ate during the day. Then I gave up candies, buns, soda, and ice cream, and quit using sugar in my coffee.” (I2)

Niemelä [38] defines the concept of enactment broadly as “concrete and observable actions and activities that happen when some form of information is received by an individual.” Our interpretation above falls into its scope.

Information sharing was described as a conversational and reciprocal event. Individuals had shared experiences and received and given support through health-related conversations. In this context information sharing referred to both health counseling and peer support among participants, which were actualized at Skype meetings. The interviewees had shared information about their own experiences, opinions, and thoughts, and also information obtained from other sources. All of the interviewees mentioned the significance of peer support in the intervention:
“As peer support the contribution of the group has been good. From the group I learned that the others did not do that well, either.” (I1)

“It’s been good to know that you are not alone with these things.” (H2)

“It’s like, you realize you are not alone with this. Others have issues, too. They have the same problems.” (I3)

“Example from others at the Skype meetings actually gave me the greatest epiphanies.” (I4)

“We had quite nice conversations and it’s been good to know that my peers have made the same mistakes as I. It was a great relief for me that others seemed to behave similarly.” (I5)

Counseling was also mentioned when talking about information sharing and support: “Counseling was like mutual interaction. --- It wasn’t coddling or preaching.” (I5)

4.2 Feasibility of the ICT applications used in the intervention

The participants were fairly satisfied with the ICT applications used and the counseling they had received via them. Their perceptions about Skype were mainly positive. Skype meetings were regarded as pleasant and the application was easy to use: “It’s convenient and I like it.” (H2) One main advantage of Skype was the fact that the participants could participate in the counseling without leaving their homes: “…you don’t have to go anywhere and think about whether or not the car is at home or where you can put the kids while in counseling…” (I1).

In some cases being able to communicate without face-to-face contact made interaction easier in the group: the relative anonymity of the group possibly made it easier to talk about delicate matters. All of the participants mentioned that they had gained support from their peers or the counselor at a Skype meeting. They had also experienced problems associated with interaction in Skype: some of them thought communication was not natural at the meetings and they had to pay attention to the participation of other group members more than in a face-to-face conversation. “In a group conversation it is difficult to know when you are allowed to speak. Somehow you can’t interrupt others the same way as in a face-to-face conversation.” (I4) Also, things suddenly happening at home might impede the Skype conversations. For example, the presence of children in some participants’ homes had affected the interaction. “The concentration was sometimes hindered. You could hear that there are small children and they were crying and then they talked to the children during the meeting. So they were not able to give their full attention to this.” (I1)

A lack of trust was mentioned in relation to the Skype conversations. There was a possibility that the content of the conversation might leak outside the group or even to the public: “You don’t know the people in the group that well. You can never know what they are doing in their homes with their computers. They might record the conversation or direct it to YouTube or something. I’m sure some people are afraid of this. You can’t have 100% trust in this.” (I4)

Despite the few problems reported, Skype was considered to have many advantages, the peer support experienced through it being one of the main ones. The web learning environment, including for example a message board, provided a variety of health-related links and other material. The participants received a user name and a password to log in. The information content of the web learning environment was found to be extensive, but its usability was poor. “…it does have information but the system scatters it.” (I4) As the web learning environment also included an extensive amount of links to other web pages, some participants felt there was too much information. The information was considered to be clinical and neutral and it did not appear personal: “They referred to web pages that contained clinical information about the heart and such. It’s not meant for me. It is neutral information and there is a lot of it. So, if you need information about how much and when and where… it does not feel personal.” (I1)
From the viewpoint of usability, the web learning environment was perceived as disorganized and complex. Use of the environment required some time and effort: the user had to log in and then find what he/she went on to look for. "There was all kinds of information in the web learning environment and there was so much of it that you had to know what you are looking for. Otherwise you could spend days in there. --- It is so awful that it can kill all enthusiasm. You have to be really interested to use this environment." (H4)

The message boards in the environment were not used. There seemed to be a barrier to writing, because others did not write, either. Some felt the counselors should have encouraged the participants more to write on the message boards. Also the danger of misinterpretation when yielding information in written form was noted "When you write something there it can be interpreted in various ways and you might anger someone." (H4) The participants were willing to use the web learning environment. However, the content and organization of information did not satisfy the needs and expectations of the participants.

4.3 Experienced Health-related changes

The participants had experienced cognitive, affective, and behavioral changes during and after the intervention. Changes at the cognitive level refer to transitions in individuals' knowledge structures or opinions [37]. In this context these changes were associated with knowledge about personal health and health behavior. The participants had obtained information about their own health and health behavior and this information had increased their health knowledge. The physiological measurements, the exercise and nutrition logs, and the self-assessment tools they used in the learning environment increased their self-awareness. The exercise and nutrition logs and assessment tools were perceived as awakeners: with the help of them the participants paid attention to their own health and health behavior more than before. They also allowed them to experience enactment.

Though general health information was not considered very important, the participants had obtained new information about fat and the caloric values of foods: "I used the calorie counter and received other information about food. I could not believe the amount of calories some foods contain." (I3)

Changes at the affective level refer to increased enthusiasm or will, or transitions in attitudes and feelings. The interviewees’ experiences of learning and understanding did not relate that much to concrete things but to the way they looked at a change in health behavior and a healthy lifestyle as a whole. They expressed that they had experienced a change in attitude and changes in the way they looked at health information: "I think the main benefit of this experience [the intervention NH] would be --- that something has happened that I can now accept some changes. It’s all about attitude, after all. It is the most difficult thing in it. It means a change in life, a change in lifestyle, and that starts with a change in attitude." (H2)

Changes at the behavioral level refer to concrete, observable actions. All of the interviewees stated that they had changed their health behavior. Especially the diet and exercise diaries had helped them realize which things to pay attention to: the amount and quality of food and exercise had become apparent. The interviewees reported increased intake of vegetables, changed fat intake, reduced salt and sugar intake, and increased amount of exercise. The changes were described as paying attention to choices in basic everyday situations: "I found the direction to a healthy lifestyle. For example, when I go to the neighbors I now find myself thinking whether to go by car or walk. I have been thinking about the options of how to exercise more." (I2) A change in health information seeking practices can also be perceived as a change at the behavioral level. Information searching on the Internet had increased with those interviewees who did not use the Internet actively, and they had obtained information from new sources.

These changes at three levels indicate that the impact of the health information delivered in this e-health intervention was in its potential to promote people’s ability to make healthy choices in their everyday lives.

5. Discussion, limitations of the study, and future research
The findings of this study are in line with previous studies [25, 26] and indicate that traditional information provision might not be enough in counseling aiming to change health behavior. Communication with a counselor and a peer group seems to be an important factor in motivating a person to change his/her health behavior. Also, information about one’s own health and health behavior can increase awareness of personal health and motivate a person to change his/her health behavior. In the context of this study, enactment had occurred especially in situations in which the interviewees had received information from other people about their health and health behavior and when they had used exercise and nutrition logs and self-assessment tools to monitor their own behavior.

Information sharing, especially within the peer group, was considered important. With the help of the peers the participants realized that also other people experience similar health problems and challenges in changing their health behavior. This is in line with earlier studies which have shown that peers can provide information about their own experiences and support others to achieve or maintain positive health behavior, and individuals might benefit from this [33-35]. However, the information shared in a peer group might also hinder individuals’ willingness to change. In this study the peers seemed to give each other permission to behave in an unhealthy manner. Thus, attitudes allowing unhealthy lifestyle may be accepted in the group, which makes behavioral changes challenging for an individual group member.

In the context of this study, information was shared at Skype meetings. Overall, Skype was considered a convenient and useful application for communication. The interviewees had actively used the web learning environment, although they perceived it merely as information storage and did not use it for information sharing. Moreover, the interviewees had encountered several problems in the use of this web learning environment. Despite these problems, they were fairly satisfied with the intervention as a whole. Previous studies have indicated that typically intervention participants are satisfied even though the influence on their health is modest [22]. It must be noted that also in this study only a few changes in the physiological measurements were reported by the participants, although they described cognitive, affective, and behavioral changes in the interviews.

A limitation of this study is its small scale. This was a rather exploratory qualitative study, which is rarely used in studying e-health interventions. The findings provide the viewpoint of the e-health intervention participant in a real-life context. This information can be useful in designing future research in this area, focusing on a more detailed examination of provision of information content and tools for its use to increase their impact on people’s health behavior. Qualitative studies are very appropriate for increasing understanding of human information behavior in the context of preventive health care.

Often e-health interventions combine a variety of methods to enhance change in health behavior. Even though interventions have proven to be effective, it can be difficult to determine what factors or elements of the intervention had the desired effect, and on the other hand to find out if some elements hindered the impact of the intervention. Therefore, new methods should be introduced to scrutinize the implementation of intervention programs in a more detailed manner than what has been done in empirical intervention studies thus far.

When looking at health education and interventions from the viewpoint of constructivism, the focus is on individual and collective construction of meanings and knowledge. Qualitative methods could be considered when investigating the impact of interventions from this perspective in order to deepen understanding of the most effective factors in interventions from the viewpoint of intervention participants.

6. Conclusions

This paper reported the findings of a qualitative study of an e-health intervention aiming at preventing cardiovascular diseases in northern Finland. Its overall aim was to increase understanding of health-related everyday life information behavior in the context of this intervention. Investigating individuals’ information behavior is important in this context, as the provision of information is usually a key method used in promoting healthy behavior. The findings show that the practices of information
seeking, use, and sharing were acted upon within this e-health intervention, and of these information sharing was perceived as the most important practice. Skype was considered advantageous for information sharing, while the web learning environment was perceived merely as information storage with much non-relevant content. The findings indicate that personalized information content and provision of opportunities for interactivity and communication are important factors in e-health interventions aiming to change health behavior. This should be investigated further in future studies.

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