A Mirror-Puzzle Tool for Wellness Reflection: Design Experiences

Anna-Liisa Syrjänen
Information Processing Science
University of Oulu
PO Box 3000 FI-90014 University
of Oulu, Finland
anna-liisa.syrjanen@oulu.fi

Kari Kuutti
Information Processing Science
University of Oulu
PO Box 3000 FI-90014 University
of Oulu, Finland
kari.kuutti@oulu.fi

Abstract
The paper discusses a project to develop a software tool for the self-care of hypertension. The project took place in the late 1990s but this domain is as relevant today as it was then, as is the experiment with a mirror-puzzle tool. Its purpose was to motivate people's own goal setting and making of tools for reflection of activities with wellbeing. The experiences can assist in the consideration of new approaches to the domain.

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Introduction
In the late 1990s, we were involved in a project with industrial partners to develop a self-care tool for people with high blood pressure, or hypertension [7]. This is a severe problem in Finland and one of the most common reasons for permanent medication. Lifestyle [4] is seen to have a significant influence on hypertension, but to change it is difficult, as it is to become motivated to conduct hypertension self-care. The reasons for this are that, although hypertension is a serious illness, it is generally not painful, and does not necessarily restrict everyday life activities. A person's genome, and physical and mental activities affect its onset but this mechanism is complex and difficult to target in relation to lifestyle, and the impact of changes made take place slowly. In Finland, there has been an ongoing campaigning against hypertension. A wide body of good healthcare materials have been produced, distributed and used to explain hypertension and how to avoid it and related illnesses, through a healthy lifestyle [5, 7, 8, 4]. However, the impact of the information

distribution has been quite insignificant. The goal of our project was to study if an interactive system could assist this work, especially with people who are at risk for hypertension, and who might make lifestyle changes if they were motivated towards self-care.

Field Studies and Project Dynamics

At the time when we started the project, computer-supported self-care was practically non-existent. Thus we conducted field studies in two hospitals with people who had hypertension and healthcare professionals involved in their instruction. We video-recorded their instruction situations and conducted video-stimulated recalls with each informant. Data were transcribed and the content analyzed, using an interpretative approach.

Results showed that lack of information was not a significant problem, as most people were familiar with the relationship between lifestyle and hypertension. The primary problem was the peripheral nature of this "book knowledge" to their daily lives. This problem has been more recently discussed by [1, 6]. Frequently, issues other than health were more dominant in people's lives. Some people valued the easiest solution (pills) in treating their hypertension but not their own possible role in actively changing their lifestyle. We thus concluded that the problem was far more deep-seated, at the level of the individual's self-image and personal motivation. Instead of providing more information or databases, we determined that the goal should rather be to improve the people's self-esteem and readiness to change their lifestyle [5] through the help of self-reflection tools. Similar evidence has been produced in relation to people's physical activity and their context [6], and regarding certain inner systems of the human body and lifestyle [8].

We also found some evidence from the data that the idea of preventing illnesses through self-care was in conflict with the practices and attitudes expressed through the official healthcare system, and with the knowledge originating from that domain. The course taken and the institutionalized health care practices (cf. [2, 3, 4]) may have had an impact on people's taking responsibility for their own wellbeing and lifestyle. Some people even resisted proactive healthcare instructions as they were seen as being controlling. However, when similar ideas emerged through people's own practices and experiences, the acceptance and application of such knowledge increased too. Similar findings have recently been demonstrated [1, 3, 6].

Based on our field study results, we inferred that the most motivating factor in achieving a change in lifestyle was a sharing of experiences, both positive and negative, with people one knows, with the possibility of creating measurement tools to enable self-reflection. We believed that a solution would need to found in the kind of system through which people could share and compare experiences, as happens in today's Social Web. In the 1990s that was far in the future, with Web 1.0 tools only just introduced. Furthermore, the domain of hypertension self-care involved an overlapping of areas of expertise from medicine, sports medicine, psychology, physiology and the science of nutrition. All of these contributed to the gamut of challenges that the project attempted to address. Application domain concepts, blood pressure, hypertension, self-care and lifestyle changes, for instance, had to be discussed and clarified with the experts. They also informed the use of relevant healthcare materials and provided references for the system design.

The project was further challenged by the industrial partners' competing interests. The partner from pharmaceutical industry was primarily interested in people's medication; the device manufacturer the role a heart rate measurement device could have in self-care, and the technology producer interested in piloting a new Java environment. The self-care database was the combined interests of all the partners and of the healthcare professionals whose desire was to ease their labor of instruction. Thus the goals of the healthcare professionals to provide instruction, and of the general practitioners involved in hypertension treatment, were included in the application domain definition although not focused on in detail in this project.

Creation of Ideas for the Design Solution

The system plan we finally arrived at was fairly complicated, as a result of balancing issues related to the self-care of hypertension with the interests of the industrial partners. However, the ideas for the core design solution could be created at a general level:

Firstly, it was necessary to avoid any obtrusive proactivity related to instruction, and to maintain the sensitivity needed when handling lifestyle issues, particularly because hypertension treatments are typically long-term. We therefore decided that the image of the self-care tool should be "neutral". A mirror was thus chosen as a central metaphor – a mirror that would help personal and private reflection, and would assist in figuring out how the self-portrait reflected in the mirror might look better in the future.

Secondly, the insights of the experts led to a division of the multifaceted self-care domain into areas such as nutrition, sports, and medication (etc) which the person needed to deal with one by one, or in the puzzle metaphor, piece by piece, in relation to his or her own life situation. We thus ended up by making the mirror into a puzzle as well, which would show that some areas in the individual's lifestyle were in order, but that other areas were not yet in the optimum condition. The idea was that one can move selected pieces of one's lifestyle puzzle in the right direction by making lifestyle changes. The system thus became a mirror-puzzle tool.

The Mirror-Puzzle Tool Definition

Given that the self-care domain, where the personal awareness and everyday reality of people with hypertension, or of those at risk for it, should be at the core [2, 4, 7], the core ideas were described:

- The basic solution is based on the self-care and active participation of the user, who can set goals for lifestyle changes, and make a concerted effort to integrate the identified issues into everyday life.
- The physiological mechanism of hypertension and its effects on the functions of a body (in relation to a person's age, gender, physiological state, etc) are shown to help in understanding self-care issues.
- Self-reflection functions provide support for lifestyle choices, including nutrition, sport, stimulants, the prevention of stress (etc) and emotional support.
- A set of visualization tools are provided that help to maintain self-control and self-image by following and comparing aspects of the lifestyle selected.

Tools enabling the user's self-reflection may be seen as a kind of dynamic mirror, facilitating views of the self from several angles: By combining goals and measures, one aims to see the lifestyle situation as it is now, and how it could be in the future. The puzzle pieces thus correspond to the relevant aspects of lifestyle, and their

positions are based on one's own measures, or related references. One's own lifestyle history and changes in one's related activities help to build self-knowledge [6] and a self-portrait of wellbeing. The system is capable of reflecting very fine changes in the positions of the pieces making up the individual's lifestyle puzzle.

The User Interface and Implementation

The user requirements for the system consisted of visualized ideas, with scenarios for all the main functions, and with their descriptions and appendices. These were accepted by the project team. The user interface definitions consisted of over 50 screen views, created several iterations. The main views were refined by a graphic designer. Figure 1 shows how the mirror-puzzle tool functions in the mirror view:

- A self-portrait puzzle is created, based on given personal details, goals for selected areas of wellbeing, or reference values when starting to use the tool, and by measures of the related activities.
- The distance of a piece from the puzzle square indicates how well or bad is the situation for that particular area of wellbeing at the moment.
- The disconnected pieces show the areas where lifestyle changes have the potential to improve wellbeing. Dashed lines show where the piece was initially and its present position the changes made.

In Figure 1, the piece relating to *medication* is in the correct place, indicating that the medication aspect is being appropriately handled, but others factors, such as *weight, nutrition, use of alcohol, use of salt, sport, smoking* and *relaxation* are not yet in place, and they indicate that efforts towards change need to be made in the future.

This simple view shows the idea of a well-being self-reflection tool, from the viewpoint of people with hypertension could be manage as using the basic PC application expected to be implemented. Yet, this view gives only a narrow picture of the whole functionality and task integrations that were defined. These included such as a parallel display of several measures with dynamic changes to results, and timeline-diagram views for short-term and longer-term follow-ups of activities, and for the comparisons the user makes. Also a set of combinations were provided for the planning of activities where alternatives were given to support decision-making. For instance, a "weight management" function was provided to support the planning of, how one could achieve ideal weight, by taking more exercise, or by decreasing or changing food intake?

Unfortunately, the planned interface was too difficult to implement with the available technology. The prototype was quite different from what was intended as it was tested in a usability laboratory (with people who had been diagnosed with hypertension and who were interested in self-care). This deficiency was partly due to the project deadline, and partly was the result of implementing the prototype with Java, which was at that time a novelty, but could not provide all the functionality and flexibility needed for the desired user interaction. The usability testing was conducted, but unfinished functions, changes in metaphors and terms, English used as a screen language, the device that required a heavy supply of power and continual breakdowns all affected the quality of the test results. On the basis of the testing, we could not say whether the users liked the idea of the mirror-puzzle tool, or would consider the system useful in supporting hypertension self-care and lifestyle reflection.

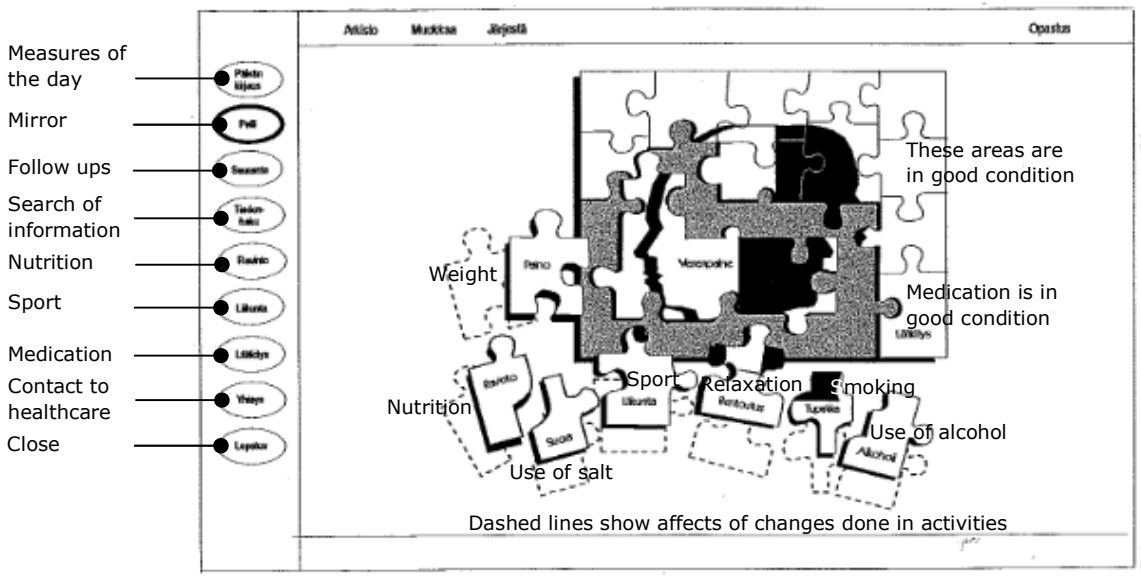

Figure 1. A mirror-puzzle metaphor in a function of mirror view (User Requirements, p. 8)

Due to these limitations, research issues we had been interested in, such as whether the system could encourage the user to become actively involved in hypertension self-care, or whether the users would have engaged with it over the longer periods of time that self-care of hypertension would require could not be researched. What we can say is that the action realized within the project and the technological problems in implementation show that we were working with a real innovation, which would have demanded far more advanced programming systems, hardware and user interface technologies than those that were available in the late 1990s. Since giving the test report, we have not heard the system mentioned again.

Concluding Remarks

The design approach used, built around the everyday realities of people with hypertension, attempting to support their health through self-care [1, 5, 6], and focusing on user experience, was and still is relevant to the application domain [3]. The pressure to offer fresh alternative means for the instruction and support of treatment for hypertension patients, or people at risk for it, were topical then [7] and are still so today [4]. As an early attempt to support the move in the health care system away from authority-led hypertension cure, and towards self-care, assisted by an interactive tool that was usable in the individual's context [6], the project can be seen as quite successful [2]. Despite the

fact that the actual implementation of the system never reached the maturity necessary for everyday use, the project did its best, but the challenges were simply too great in relation to available resources.

According to Fitzpatrick and Ellingsen, during the 25 years of CSCW research in Healthcare, designing has "tended to be much less prevalent than understanding" in work-place driven systems studies [2]. Given that we defined the mirror-puzzle tool for the self-care of hypertension over fifteen years ago, our design experiences can be seen as making a contribution to design, involving the people-centered aspects so much needed in that domain. We also believe that the definition of user requirements can be seen as useful in relation to the versatile approach to wellness technology used today in approaching the needs of individual users and "expanding from physical wellness towards more holistic definition and services" (CFP Designing for Wellness and Behavior Change, NordiCHI 2012). We do hope that this paper will result in revitalized interest in this concept and that recent developments in the technology will now be able to achieve what we had envisaged. It would be interesting to see the user interface implementation we described over fifteen years ago, and whether the design ideas generated for hypertension self-care could be useful in some other context where people need support in making goal-based life-style changes.

In conclusion, our mirror-puzzle tool concept was an early attempt to develop a relatively holistic medium for healthcare and wellness reflection purposes. We hope this work will inspire new attempts at design and new approaches to this extremely important domain.

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