

Master Thesis in Interaction Design

# Approaching Medical Technology Products for Everyday Life

**Hanna Friberg**

Göteborg, Sweden 2005



IT University  
of Göteborg

CHALMERS | GÖTEBORGS UNIVERSITET

Department of Computing Science



REPORT NO. xxxx/xxxx

# Approaching Medical Technology Products for Everyday Life

HANNA FRIBERG



Department of Computing Science  
IT UNIVERSITY OF GÖTEBORG  
GÖTEBORG UNIVERSITY AND CHALMERS UNIVERSITY OF TECHNOLOGY  
Göteborg, Sweden 2005

Approaching Medical Technology Products for Everyday Life  
HANNA FRIBERG

© HANNA FRIBERG, 2005.

Report no xxxx:xx

ISSN: 1651-4769

Department of Computing Science

IT University of Göteborg

Göteborg University and Chalmers University of Technology

P O Box 8718

SE – 402 75 Göteborg

Sweden

Telephone + 46 (0)31-772 4895

Chalmers Repro

Göteborg, Sweden 2005

Approaching Medical Technology Products for Everyday Life

HANNA FRIBERG

Department of Computing Science

IT University of Göteborg

Göteborg University and Chalmers University of Technology

## ABSTRACT

Medical technology products seem to be focused on technology and function. In case of a sickness we sometimes have to use these things for a shorter period of time, for instance at a hospital. In some cases we have to live with them throughout life, as for chronic sickness. When we have to live with this kind of things in our home environment we might have different demands on them compared to in a hospital environment. We have to live with them, no longer at the hospital but out there, in the “real” world, in our everyday life. This puts the objects in new lightning. With starting point in the everyday life this thesis suggests a reconsideration on designing within the field of medical technology. An approach was formed, where three crucial points have been made. Enabling for meaningfulness is vital. Form can be used as base in designing. Function certainly has to be present, but not as a selfevident or unchallenged point of departure. Playfulness can expand the scope in designing within this field. This approach implies that we should design within the field of medical technology from the same starting point as being used in all other design of everyday things.

Keywords: everyday life, everyday things, meaningfulness, form, playfulness, medical technology, participatory design.

## ACKNOWLEDGEMENTS

This master thesis was written within the research project IT & Textiles at RE:FORM Studio, The Interactive Institute. The research project was funded by VINNOVA. Thank you Fang Chen, my supervisor at Chalmers, and Johan Redström, my external supervisor at RE:FORM, for your support, comments, guidance and invaluable discussions. Thank you Ramia Mazé and all you others at RE:FORM for making my time with you so enjoyable. I also would like to thank the participants in the case study for being so dedicated, engaged and interested in the making and progress of this thesis. This thesis could never have been made without your contribution. Figure 2 was made by Klara Friberg. Figure 3a was given to me by one of the participants. All other figures were made by me.

## TABLE OF CONTENTS

<b>1. INTRODUCTION .....</b>	<b>7</b>
1.1 RESEARCH QUESTION AND PURPOSE .....	7
<b>2. BACKGROUND.....</b>	<b>8</b>
2.1 THE THEORETICAL FRAMEWORK.....	8
2.2 COMPUTATIONAL TECHNOLOGY AND TEXTILES.....	9
2.3 EVERYDAY LIFE AND EVERYDAY THINGS .....	9
2.4 INTRODUCTION TO THE CASE STUDY: SCOLIOSIS .....	12
2.5 PREVIOUS RESEARCH .....	13
2.5.1 <i>Experiences on having Scoliosis</i> .....	13
2.5.2 <i>Health Care and IT in a Home Environment</i> .....	14
2.5.3 <i>Computational Technology and Textiles in Medical Technology Products</i> .....	15
<b>3. METHOD.....</b>	<b>15</b>
3.1 THE METHODOLOGICAL FRAMEWORK .....	15
3.2 OVERVIEW OF THE CASE STUDY .....	16
3.2.1 <i>Finding and Selecting the Participants</i> .....	16
3.3 THE DESIGNER CREATES AN UNDERSTANDING .....	17
3.3.1 <i>Try It Yourself</i> .....	17
3.3.2 <i>The Qualitative Interviews</i> .....	17
3.4 THE WORKSHOP: THE PARTICIPANTS AND THE DESIGNER CREATE A DESIGN CONCEPT .....	18
3.4.1 <i>The Workshop: Phase by Phase, Method by Method</i> .....	19
3.4.1.1 Getting Together: Drama.....	20
3.4.1.2 Sorting out the Problems: Brainstorming and Discussion .....	20
3.4.1.3 Exploring the Idea: Discussion, Prototyping and Sketching.....	20
3.4.1.4 The Creative Hour: Prototyping, Storyboarding, Bodystorming and Experience Prototyping .....	21
3.4.1.5 Closing the Workshop: Discussion.....	22
3.5 ANALYSIS .....	22
3.5.1 <i>Try it Yourself</i> .....	22
3.5.2 <i>The Qualitative Interviews</i> .....	22
3.5.3 <i>The Workshop</i> .....	22
<b>4. RESULTS.....</b>	<b>23</b>
4.1 THE DESIGNER CREATES AN UNDERSTANDING .....	23
4.1.1 <i>Try it Yourself</i> .....	23
4.1.2 <i>The Qualitative Interviews</i> .....	24
4.1.2.1 Me and Myself .....	24
4.1.2.2 The Scoliosis .....	25
4.1.2.3 Everyday Life.....	25
4.1.2.4 Close Relations.....	26
4.1.2.5 Social Contexts.....	27
4.1.2.6 The Society.....	28
4.1.2.7 Summary .....	29
4.2 THE WORKSHOP: THE PARTICIPANTS AND THE DESIGNER CREATE A DESIGN CONCEPT .....	30
4.2.1 <i>Getting Together</i> .....	30
4.2.2 <i>Sorting out the Problems</i> .....	30
4.2.3 <i>Exploring the Idea</i> .....	31
4.2.4 <i>The Creative Hour</i> .....	33
4.2.5 <i>Closing the Workshop</i> .....	35
4.2.6 <i>Summary</i> .....	35
<b>5. DISCUSSION.....</b>	<b>36</b>
5.1 RESULT DISCUSSION.....	36

5.1.1 <i>Meaningfulness in Design</i> .....	36
5.1.2 <i>Form and Function Revisited</i> .....	38
5.1.3 <i>Playfulness in a Serious Context</i> .....	39
5.1.4 <i>Formulating an Approach</i> .....	39
5.2 METHOD DISCUSSION .....	40
5.3 FURTHER WORK .....	41
5.4 CONCLUSIONS.....	42
<b>REFERENCES .....</b>	<b>43</b>
<b>APPENDIX A .....</b>	<b>47</b>
<b>APPENDIX B.....</b>	<b>48</b>

## 1. Introduction

I was visiting a friend and her mother some years ago. Her mother had problems with her lungs, and needed oxygen therapy, which meant to constantly add oxygen into her nose through an oxygen machine. It was hard for her to leave the house, since she was attached to this machine. This made her life a bit complicated. When I saw her, I recognized that I looked at her *and* her oxygen machine, almost as if they were one. In some way I thought that she looked a bit sicker than she probably was. Maybe this was connected to the fact that I was not used to seeing a machine like that, and certainly not in somebody's home. The hospital was present through this thing and as I looked at her, I was reminded of her sickness.

Medical technology products seem to be focused on technology and function. When we have a sickness we sometimes have to use or be exposed to this kind of technology. It can be all from respirators to zimmer frames, from dialysis machines to stoma bags and so on. Sometimes we have to use these things for a shorter period of time and in some cases we have to live with them throughout life, as for chronic sickness. What happens when these technology-focused and function-oriented objects enter our homes and become a part of our everyday life and everyday things? Do they fit our everyday life? Do they fit us? It is reasonable to believe that there is a difference between which roles these things play at a hospital and how we relate to them in a home environment and which role they are given there. The point in the introducing anecdote is that when we have to live with this kind of things at home we might have different demands on them compared to in a hospital environment. We have to live with them, no longer at the hospital but out there, in the "real" world, in our everyday life. This puts the objects in new lightning.

The following prerequisites were given for this thesis. The frame was IT and textiles, since the thesis was written within the research project IT & Textiles<sup>1</sup>. This implied using computational technology and textiles as design material in this thesis. Additionally, health care applications in a home environment were given as a starting point. This brought the aspects of chronic sickness, medical technology, and everyday life in the thesis. The user was to be the starting point, which led me into the area of participatory design.

### 1.1 Research Question and Purpose

With starting point in the above stated the following research question can be formulated:

*How can medical technology products be approached in order to achieve a more playful design that corresponds to the person, her everyday life and her home environment?*

This question is based on the assumption that there are medical technology products that do not fit us, our everyday lives and/or home environments as they are designed now. The different components in the question have to be interpreted. In this thesis *playful* is understood as unlimited possibilities and that only the imagination sets the borders of

---

<sup>1</sup> The IT & Textiles' webpage: <http://www.tii.se/reform/projects/ittextiles/index.html>

what you can do. *Everyday life* is interpreted as the life one is experiencing. *Home environment* is seen as being where you or someone else live.

The purpose is to illuminate some critical points in designing within the field of medical technology through using a participatory design methodology in creating a design concept.

The thesis will not result in a ready prototype, but will be held on a conceptual level. Possible technical aspects on the concept will not be examined. Neither will peoples' general attitudes towards IT, textiles and medical technology products be examined. This thesis is targeted at those who are working with or interested in interaction design and are particularly interested in methodological issues.

## **2. Background**

This chapter presents the different parts that this thesis constitutes of. In the first subchapter the theoretical framework is introduced. In the following computational technology and textiles are presented. Further, everyday life and everyday things are brought up. A case study on scoliosis is presented. Finally, the chapter ends with a review of previous research.

### **2.1 The Theoretical Framework**

The design philosophy for everyday computational things introduced by Redström (2001) is used as theoretical framework in this thesis. As computers will become more frequently embedded in the things around us, computational things will become everyday things. This presupposes a consideration on how these things shall be designed as we are going to live with them. Hence, using computational technology is not the central issue in design, but living with it. From this point of view enabling for meaningful presence in everyday life is central in the design of computational things. Focus is on presence rather than on use, on meaningfulness rather than on usability and functionality, and views aesthetics as base in design instead of psychology. It supports a general philosophy of technology. The design philosophy is built on the following four parts:

- (1) *Computational technology is a design material*
- (2) *Time is the central design variable*
- (3) *Presence precedes use*
- (4) *Aesthetics is the basis for design (Redström, 2001, p 38)*

Computational technology as *design material* implies that it is regarded as any kind of material that is used for design, and not for implementing functionality. The execution of programs is what gives the characteristics to a computational thing. Then, the two form elements of temporal and spatial structures rise, which are to be balanced. Simplified, computational technology uses the temporal structures and all other kind of material manifest the spatial structures. This means that in the actual building of a computational thing the materials are to be combined. According to the design philosophy *time is the central design variable*. The form element temporal structures bring a time aspect. This form element distinguishes computational technology from many other design materials.

The third element states that *presence precedes use*. As an object enters our lives it becomes a part of our lifeworld. As we have accepted the thing in our lives, it has become a meaningful object to us. In everyday things, use and functionality is not how we refer to them, and then, presence precedes use. Thus, a meaningful presence of the computational thing is focal, and functionality peripheral. The fourth part deals with one of the starting point in design; *aesthetics*. Aesthetics are, together with expressions, focal in the crafting of a new design material, as well as in designing for meaningful presence in everyday things. With aesthetics as one base, then designing can not be about aesthetics in opposition to usability. In the design approach of creating everyday computational things, aesthetics together with other qualities such as emotional and social have to be interwoven initially.

This is the framework from which this thesis can be understood and interpreted. The framework was chosen to act as a base in this thesis, due to its focus on designing with computational technology for everyday life and everyday things. This design philosophy emphasizes that there are other things than functionality and use that can act as starting points in designing everyday computational things (Redström, 2001), which also suited this thesis.

## **2.2 Computational Technology and Textiles**

In this thesis two materials are used as base in the design; computational technology and textiles. These two differ in many ways, but also have points of contact. Computational technology has a relative short tradition, while textiles have a long. It is an accepted fact that textiles are used as design material. It has been used for thousands of years for clothing and such (Post et al., 2000). Due to its recent history, it is reasonable to believe that computational technology has not become generally apprehended as a design material. It may seem that when novel technology is introduced in society some grade of resistance exists. Are people patient and acceptant towards textiles due to the very long tradition to use them and on the other hand, not as used to IT since IT is, compared with textiles, new? As we have accepted and embraced textiles in our everyday objects, we might turn towards doing the same with IT. Textiles entered our lives a long time ago, and computational technology is gradually entering our lives now: “As computers pervade everyday life, they too will become everyday things (Redström, 2001, p 1).” Despite the short history of computational technology it has taken many turns; from computers being large as a house, to becoming small fitting a pocket. Textiles have been involved in a few revolutions as well, for instance the invention of the flying shuttle (Park and Jayaraman, 2001). Today textiles seem to face another revolution through combining it with computational technology.

## **2.3 Everyday Life and Everyday Things**

Using computational technology and textiles in combination as design materials rise an issue on form and function. If we make an assumption that technology traditionally is associated with functions, and textiles with form, we can assume that a combination of the two prepares for and demands a revaluation on this conception. If these two materials are to be joined in an everyday thing for everyday life what are our conceptions like then?

One view on form and function is based on the conception that they are divided. In this view form correlates to aesthetics and social needs. Function points out the importance of usefulness and usability (Tractinsky et al., 2000). Another apprehension is that form is function (Westerlund, 2002). If an object is being used in the intended way the form has helped. In this way the objects' form has become a function. Its' role is to act as a medium to communicate and express functions. Interpreting this, function is the basis. Mazé and Redström (2004) have another view. In creating an understanding of computational things they suggest form as foundation. Form can then also act as a basis in handling the complexity. They see the computational object as having both spatial and temporal form as form elements. Then, the material of the thing, and as well as how we interact with it, affect the form. This conception results in an approach where use in terms of temporal and spatial dimensions and the *object as experienced* is fundamental. On the notion of form, Ilstedt Hjelm (2004) means that form express something that we apprehend, and that the object then becomes a sign with different meanings constructed by us. Thus, an objects' form is a communicator between us and the object. She further argues:

We find ourselves today at a point where technology and science are as complex and strained as aesthetics was a hundred years ago. Perhaps it is time to see how aesthetics, in a wider sense, could guide technology. Function follows form: design as a way of creating meaning and comprehensibility in a world of over-functional chaos. (Ilstedt Hjelm, 2004, p 98)

Ilstedt Hjelm (2004) suggests a transformed starting point in design with technology, where form is the basis rather than function.

Everyday things are “[...] things we live with. They are the building blocks of our lifeworlds (Redström, 2001, p1).” From this perspective everyday objects are objects that have a meaningful presence in our life. The design of computational things must open up and make room for the meaningfulness to take place (Hallnäs and Redström, 2002). In designing for everyday life we must take its complexity into consideration. This implies that we cannot only design for functionality and usability (Redström, 2001). Ilstedt Hjelm (2004), who have a slightly different view, argues that as we form things, they in turn form our world and provide a setting in which our actions take place. The meaning in the objects is something that we actively construct. In regarding objects as social actors in our lifeworld, the usage transcends into cooperation with the object. In this way design work turns focus into creating a platform for the interplay between the object itself and its social environment. Ilstedt Hjelm (2004) argues that this view, to see objects as social actors, can show the way in terms of how interaction ought to be designed. This implies that “The world of artifacts becomes a social world and the interplay between artefact/individual resembles the interplay between the social world and the individual (Ilstedt Hjelm, 2004, p 196).” Abowd and Mynatt (2000) talk about computers in our everyday life and how they can be integrated to it, rather than how we can use computational technology in the design for it. They introduce *everyday computing*, a view stemming from ubiquitous computing. The constant interaction brought by this paradigm raises issues for computers in everyday life:

The focus for the human at any one time is not a single interface to accomplish some task. Rather, the interaction is more free-flowing and integrative, akin to our interaction with the rich physical world of people, places, and objects in our everyday lives (Abowd and Mynatt, 2000, p 53 f).

Consequently, in designing we can take advantage of what already is there, in terms of how we interact with people and things in everyday life.

The everyday life can look differently for different people. We have different prerequisites, and do different things. For some people health care is a part of everyday life, more or less frequently recurrent. In those cases, some people take part of health care through visiting hospitals or health centers, and in some cases health care personnel visit care-takers in their home environment, in case of home health care. In some cases self care is taken place. This could be the case in chronic sickness. The latter is of interest in this thesis, due to the focus on everyday life. In some cases of sickness medical technology products are used. Swedish law on medical technology products<sup>2</sup> 2§ states:

2 § Med en medicinteknisk produkt avses i lagen en produkt som enligt tillverkarens uppgift skall användas, separat eller i kombination med annat, för att hos människor enbart eller i huvudsak

1. påvisa, förebygga, övervaka, behandla eller lindra en sjukdom,
2. påvisa, övervaka, behandla, lindra eller kompensera en skada eller ett funktionshinder,
3. undersöka, ändra eller ersätta anatomin eller en fysiologisk process, eller
4. kontrollera befruktning. (Lag (1993:584) om medicintekniska produkter<sup>2</sup>)

This paragraph says, among other things, that a medical technology product is a product that shall be used to treat, comfort, prevent, show a disease, or to show, survey, treat or compensate an injury or disability, or to examine, change or replace the anatomy or a physiological process. Regarding requirements for medical technical products, Swedish law on medical technology products<sup>2</sup> 5§ states:

5 § En medicinteknisk produkt skall vara lämplig för sin användning. Produkten är lämplig om den vid normal användning för sitt ändamål uppnår de prestanda som tillverkaren avsett och tillgodoser höga krav på skydd för liv, personlig säkerhet och hälsa hos patienter, användare och andra. (Lag (1993:584) om medicintekniska produkter<sup>2</sup>)

This paragraph states that the product should be suitable for its use. This means for instance that it should achieve the performance aimed by the producer in normal usage. The Swedish law is adapted to the EU regulations. This definition embraces all from simple product to advanced systems<sup>3</sup>. Then, how is design approached within the medical technology field? Design is often used from an engineering perspective (see Aronson,

---

<sup>2</sup>The Swedish law on medical technology products (Lag (1993:584) om medicintekniska produkter) [http://rixlex.riksdagen.se/htbin/thw?%24%7BHTML%7D=SFST\\_LST&%24%7BOOHTML%7D=SFST\\_DOK&%24%7BSNHTML%7D=SFST\\_ERR&%24%7BMAXPAGE%7D=26&%24%7BTRIPSHOW%7D=format%3DTHW&%24%7BBASE%7D=SFST&%24%7BFREETEXT%7D=&BET=1993%3A584&RUB=&ORG=](http://rixlex.riksdagen.se/htbin/thw?%24%7BHTML%7D=SFST_LST&%24%7BOOHTML%7D=SFST_DOK&%24%7BSNHTML%7D=SFST_ERR&%24%7BMAXPAGE%7D=26&%24%7BTRIPSHOW%7D=format%3DTHW&%24%7BBASE%7D=SFST&%24%7BFREETEXT%7D=&BET=1993%3A584&RUB=&ORG=)

<sup>3</sup> The Medical Products Agency's webpage: <http://www.mpa.se/medicinteknik/prod.shtml>

2004; Druzgalski, 1998; Lawrence, 2003), where technology, material and function is recurrent.

## 2.4 Introduction to the Case Study: Scoliosis

In order to try the research question out it was applied on a case study concerning the chronic sickness scoliosis.

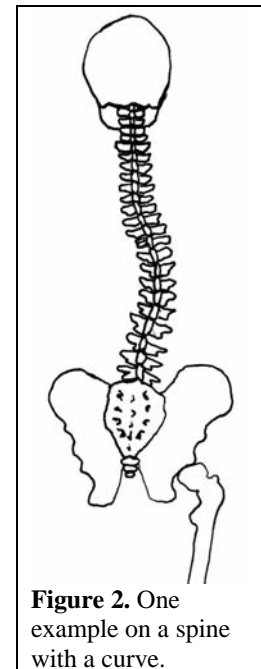


**Figure 1.** A scoliosis with a hunch on the right side.

Scoliosis is a back deformity where the spine is rotated, which additionally brings a deformity of the thorax (see Figure 1). The most common form of spinal deformity is called idiopathic scoliosis<sup>4</sup>. Veldhuizen et al. (2002) mean that “Idiopathic scoliosis is a complex three-dimensional deformity of the trunk, characterised by lateral deviation and axial rotation of the spine, usually accompanied by a rib cage deformity (Ibid., p. 209)” (see Figure 2). The origin, aetiology, of idiopathic scoliosis is not known yet. This becomes a challenge for the treatment (Veldhuizen et al., 2002). Idiopathic scoliosis is divided into infantile (birth - 3 years), juvenile (3 years - puberty) and adolescent (puberty - finished growth) scoliosis, depending on in which age it is discovered<sup>4</sup> (Scoloveno et al., 1990). Scoliosis can also be syndrome related, post polio related, congenital related or neuro

muscular<sup>4</sup>. To determine the size of the scoliosis the angle of the curve is measured. This is called the Cobb-angle. The scoliosis can progress. In adolescent idiopathic scoliosis it is related to the persons’ remaining growth potential and biomechanical conditions<sup>4</sup>.

The treatment decisions are based on the Cobb-angle<sup>4</sup>. The treatment is either bracing or operation (Scoloveno et al., 1990). Simplified, operation can be considered if the Cobb-angle is 40-50 degree or higher. The operation means that the spine is straightened out and the scoliosis is prevented from progressing. The brace is used if the Cobb-angle is lower than 40 degrees Cobb<sup>4</sup>. The goal is to prevent the scoliosis from progressing and to stabilise the curves (Ugwonali et al., 2004; Veldhuizen et al., 2002). The brace is a medical technology product and is accordingly vested. In case of adolescent idiopathic scoliosis the brace has to be worn 20-23 hours per 24-hour period in order to be effective as a treatment. It is worn until the length-growth has stopped. In practice this means that the patient can wear the brace for several years (Coillard et al., 2003; Veldhuizen et al., 2002), and that it is worn during the adolescents. The history of the brace used as treatment for scoliosis goes back to 1800 (Ugwonali et al., 2004), and is



**Figure 2.** One example on a spine with a curve.

<sup>4</sup> [https://www.msecportal.org/portal/editorial/PublicPages/sof/536890044/SOTA\\_Ortop\\_Ryggsjukd.pdf](https://www.msecportal.org/portal/editorial/PublicPages/sof/536890044/SOTA_Ortop_Ryggsjukd.pdf)



**Figure 3a. A**  
Milwaukee brace from the 1960s'.



**Figure 3b.**  
Harrington rods that were used in scoliosis operation.

the oldest known treatment for scoliosis (Veldhuizen et al., 2002). In the 1940s' the Milwaukee brace was introduced (see Figure 3a), with which the brace treatment had its break-through<sup>4</sup>. This brace started under the chin and went down on the hips. The Boston brace was introduced in the 1970's (Ugwonali et al., 2004). Today there are several variations based on the Boston brace (Coillard et al., 2003; Veldhuizen et al., 2002). The development of braces as treatment for scoliosis has been based on empirical trial and error (Veldhuizen et al., 2002). Veldhuizen et al. (2002) mean that brace design to a great extent has focused on

the brace's efficacy, and it in this way has overlooked teenagers' need of the braces' physical appearance. Teenagers do not want to act or look different from their equals (Veldhuizen et al., 2002). In this sense the design of braces has not been focusing enough on the physical appearance, in terms of the person's body movement. This is one dimension on the brace design; to be able to have the same movements as others without brace. Operation as treatment was initiated during the 1960s'. Figure 3b shows Harrington rods that were used to straighten out the spine in operation.

## **2.5 Previous Research**

### **2.5.1 Experiences on having Scoliosis**

Studies on psychological effects on bracing have been centred on long-term effects on scoliosis treatment, non-compliance and ability to deal with stress of chronic disability (Olafsson et al., 1999). Regarding long-term effects on adolescent scoliosis patients treated 20 years ago, the psychological well-being is considered as quite good. However, the patients had a lower cosmetic well-being than their peers. The result is seen as being applicable on the treatment given today (Danielsson et al., 2001).

Since adolescent idiopathic scoliosis is the most common form of scoliosis, most research on scoliosis is focused on adolescents and on bracing. Adolescence is a sensitive period of life (Reichel and Schanz, 2003) involving emotional variations and instability, and bodily changes (Olafsson et al., 1999). This sensitive phase of life requires a special adjustment in the occasion of a chronic disease (Reichel and Schanz, 2003). Reichel and Schanz (2003) state that

The diagnosis and treatment of idiopathic adolescent scoliosis can have significant psychological consequences for affected individuals. [...] For scoliosis patients this means, for instance, facing up to cosmetic impairments and subjectively significant physical defects. Cognitively the patient must come to terms with a commitment of time-consuming, confining, and sometimes uncomfortable treatment for a condition that does not always cause physical symptoms and to achieve success which is not necessarily defined as an improvement in the state of health. (Reichel and Schanz, 2003, p 221)

According to one study it was stated that adolescents with scoliosis have lower body-image perception than non-scoliosis adolescents. Within the scoliosis group the girls had lower body-image perception compared to the boys (Sapountzi-Krepia et al., 2001), a finding supported by Olafsson et al. (1999). According to one study, brace wearing does not affect self-image negatively (Olafsson et al., 1999). Regarding quality of life for children and teenagers with scoliosis, scoliosis can be a risk factor for impairment, which is particular so if brace wearing is to take place (Reichel and Schanz, 2003). However, Ugwonalie et al. (2004) claim that bracing does not decrease quality of life. The diverse results can originate in differences in types of scoliosis included in the studies. It is stated that a good relationship between mother and child is positive for brace treatment (Olafsson et al., 1999). Also support from other directions can be appropriate: "Support for patients within the context of in-patient rehabilitative treatment has proved to be both necessary and helpful. Here, within the setting of psychological group sessions and individual discussions (Reichel and Schanz, 2003, p 221)." In the adolescents dressing similar to peers is of importance, while "conventional dress is vital to social adjustment (Liseky-Fitzwater et al., 1993, p 17)." They further mean that "Deviation from normative standards of dress can have disastrous effects on a young person's social acceptance (Liseky-Fitzwater et al., 1993, p 17)." According to their study, adolescents with scoliosis did not use clothing for self enhancement or for compensating the impairment. They found that there was a relationship between appearance and awareness of clothing of the scoliosis patients, a stronger one than for their peers without scoliosis. This previous research shows a focus on young people with scoliosis, while there is little research done on gown-ups or elderly people. Most research were quantitative studies, while qualitative studies were lacking on this matter. The previous research was searched for in the databases CINAHL and Medline.

### **2.5.2 Health Care and IT in a Home Environment**

There is research and projects with focus on health care and the care givers. In other words, the research has the care givers' perspective on what can facilitate and efficate their work (see Andersson, 2002). Little research is done from the care takers' perspective (Lehoux, 2004). However, most research from this perspective is done in a hospital environment (see Bers et al., 2001; Bers et al., 1998), where one perspective is children staying connected to school while being at hospital (see Weiss et al., 2001). Research done on health care in a home environment concerns either how the work can be facilitated for the care givers (see Andersson, 2002), or the elderly population and is focused on the question on how to deal with the growing number of elderly people that fewer persons is caring for in the future (see Andersson, 2002; Mynatt et al., 2000). This research is focused on how they can stay connected and independent (see Bouma et al., 2004; Mynatt et al., 2000). The research is then focused on how to "solve" or deal with an upcoming problem in society, and less on the persons. Little research is done on persons with chronic sickness and their needs based on their everyday life in a home environment. This perspective is minimal. However, research is done. Lehoux (2004) conducted qualitative research on patients with chronic sickness and their apprehension of their medical technology products in the home. Research is also done on smart homes in relation to health care and designing IT artefacts for well-being in a home environment

(see Ilstedt Hjelm, 2004). The previous research was searched for in the databases ABI/Inform Global, ACM Digital Library, CINAHL, IEEE Xplore, Kluwer, Medline, and Science Direct.

### **2.5.3 Computational Technology and Textiles in Medical Technology Products**

The field of computational technology and textiles in medical technology products is obviously under development, since most research found is mentioning health care applications as being a suitable area where smart textiles/intelligent textiles/e-textiles<sup>5</sup> can be used (see Marculescu, et al., 2002; Martin et al., 2004; Mecheels, 2001; Pratab et al., 2002). One aspect is using this kind of applications for monitoring and surveillance (see Mecheels, 2001). Actual projects where this kind of applications or products has been developed are seemingly few. They focus on the monitoring aspect<sup>6</sup>. The previous research was searched for in the databases ACM Digital Library, CINAHL, IEEE Xplore, Kluwer, Medline, Science Direct, Textile Technology Index, and World Textiles.

## **3. Method**

The method chapter is divided into five subchapters. The first part introduces the methodological framework. The second part provides an overview of the case study. The third part describes how the designer created an understanding and the methods used in order to achieve that. The fourth part presents the workshop and the methods that the participants and the designer were using to generate ideas and to create a design concept. The fifth part describes how the data was analysed.

### **3.1 The Methodological Framework**

The methodological framework used in this thesis was inspired from participatory design (PD), with special attention to collaborative aspects. PD can be seen as a set of practices, theories and studies, where the end-users are fully participating in the process of developing hardware and software products and in activities based on computers (Muller, 2002). PD evolved in the 1970's through increased worker influence at work places. This was made possible through new legislation (Bödker et al., 1993). Today, PD has been used not solely in research contexts, but also in commercial settings (Muller, 2002). A disadvantage or critique of PD is the lack of generality. This lack rises from the development in a particular context (Mackay, 2004). The dimensions of work and politics in PD (see Bödker et al.; 1993, Ehn, 1992), were not used in this thesis. In the context of this thesis there was no work environment involved, which then excluded the political dimension. As Jacobs and Mazé (2004) argue: "... explicit work- and task-oriented contexts may not have the same applicability in designing for everyday life contexts with respect to differences in internationalities and values (Jacobs and Mazé, 2004, p 114)." Hence, another implication was required, in order to define a methodological framework within which the case study could take place. In the context of this case study, the focus

---

<sup>5</sup> Smart textiles/intelligent textiles was here used as different denominations where computer components were integrated in fabric (see Mecheels et al., 2001; Pratab et al., 2002). "E-textiles rely on simple computing elements embedded into fabric or directly into active yarns. (Marculescu et al., 2002, p 175)."

<sup>6</sup> See the V-TAM project [www.tamtelesante.com](http://www.tamtelesante.com)

of PD was then interpreted as being the users' participation in the design process. Thus, the users were seen as participants in the design process, who collaboratively with the designer contributed to the actual design. The participants and the designer then became collaborators, each of them contributing with knowledge to the design process. Thus, the notion of cooperative design (Bödker et al., 1993) was emphasised in the methodological framework. One of the requirements in this thesis, as stated in the introduction, was a user focus. I wanted the case study not only be centered on users, but also to bring them into the actual design process, and thus use their knowledge in a direct way. That was the reason behind using this framework.

### **3.2 Overview of the Case Study**

The aim of the case study was to develop a design concept for persons with scoliosis with starting point in their everyday life. In order to concretize the methodological framework Try it Yourself (IDEO, 2003), qualitative interviews and a workshop were conducted.

#### **3.2.1 Finding and Selecting the Participants**

In the work of selecting the participants in the case study the following selection criteria were chosen:

1. The person must have scoliosis
2. The age group is 40 years and more
3. The scoliosis was developed in the childhood or youth
4. The person is willing to share experiences
5. The person is willing to participate in the study volunteer

Firstly, the person had to have scoliosis to participate, since that was the scope in the case study. The second selection criterion age group was chosen because the larger part of earlier research on scoliosis was focused on young people (see 2.5.1 Experiences on having Scoliosis). This evoked an interest to focus on the more "unseen" or "forgotten" scoliosis group, which was the grown-ups. Another reason for this was that since most scoliosis is developed in the childhood or youth<sup>4</sup>, an assumption was made that grown-ups had a long time of experience to relate to, talk from and lean back on. That assumption was also the reason to the third selection criterion. The participants had have scoliosis for a long time. Another reason to the third selection criterion was that they would then be comparable in the way that the sickness had started in the same time in life. The fourth criterion was chosen so I could gain understanding of how it is to live with scoliosis. The fifth criterion was important in the sense that they then also would like to contribute to the study.

In order to find the participants three channels were used. Posters were put up in different places interpreted as being environments where persons with scoliosis might be at some occasion. Contact was taken with an association for persons with scoliosis. A contact with a nurse on a scoliosis ward at a hospital was also established. One participant was found via the association. Two participants contacted me via the posters. One of them led three other participants to me.

### **3.3 The Designer Creates an Understanding**

In order to understand the setting, how it is to live with scoliosis, and what issues there might be, Try it Yourself (IDEO, 2003), and qualitative interviews were chosen as methods.

#### **3.3.1 Try It Yourself**

Try It Yourself (IDEO, 2003) enables the designer to try the design herself. In this context the method was used by trying out an already existing product, and not the design created in the project. The method was used in the beginning of the study in order for me to obtain a feeling and understanding of what it could be like to wear a brace. Through this I could challenge my conceptions and pre-understanding on scoliosis and brace. The method was also a way to increase the reflexivity, as described by Ehn and Klein (1999). According to Hammersley and Atkinson (1995) this is to compare with an analytic reflection. The brace is an object that persons with scoliosis often meet at some point during their life, and was the reason why it was chosen. I wore a soft brace for a few days. I kept a diary in which I wrote down my reflections on the experience.

#### **3.3.2 The Qualitative Interviews**

In this thesis an approach of reflexive interviews (Hammersley and Atkinson, 1995) was adopted. In the reflexive interview specific questions are not always prepared at forehand, but rather as question areas. Questions are not asked in the same order, and are not asked in the exact manor to each participant. To let the interview be reflexive means an allowance to let each interview flow in directions that seems naturally (Hammersley and Atkinson, 1995). A possible problem with this approach could be that the interviews could be hard to compare, in the way that the outcome could become different. The goal with the interviews in this study was for me to gain understanding and to create a picture of how it is to live with scoliosis. Different people have lived different lives and thus have different experiences. This made it crucial to let the interviews be open for the participants to bring up issues where ever they found it suitable. I made up a sheet with question areas (see Appendix A). The questions served as a reminder for me as an interviewer, and were treated according to the above mentioned.

Six persons were interviewed; five women and one man: A 50 years old, B 53, C 72, D 57, E 65, and F 46. All of them had scoliosis, which was developed in their childhood or youth. Some of them also had other sicknesses or disabilities. Two of them had breathing machines at home to use at night. All of the participants had been using a brace at some period in their life and one person was still using it. Their professions were varied, all from dressmaker to lab assistant. Today three of them were retired. Two of them were working and one was on sick-leave but usually working. Four of the six interviews took place in the participants' homes, and the other two in more work related environments. The interviews were recorded on a tape recorder with permission from the participants. The participants were informed that they were anonymous, that the interviews were used for research purpose, that the participation was voluntary and could be ended any time without reason, and that the tapes were only to be listened by me and that they are to be kept in a safe place for 10 years. Afterwards the interviews were fully unidentified and transcribed verbatim.

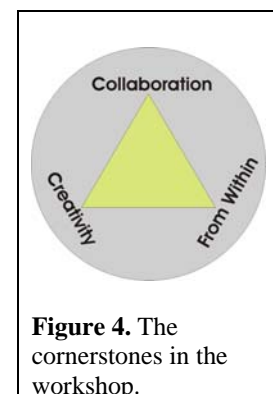
Gathering data on personal experiences grounded for ethical considerations from my point of view. In the result I chose to erase all names; personal names, companies names, names on cities and so forth to unidentify the data. The participants were denominated according to the alphabet; A to F. The man was switched into a woman and a woman into a man, to unidentify further. Furthermore the ages were changed a bit, but existed within the age frame. Their background is briefly described due to this reason. Citations are used at carefully selected places in the result in order to unidentify even more. In the citations “[...]” means excluded words. This exclusion was judged not to affect the content.

### **3.4 The Workshop: The Participants and the Designer Create a Design Concept**

The workshop was decided, with arguments to follow, to build on the following three cornerstones (see Figure 4):

- Collaboration between participants and designer
- The design concept comes from within the participants
- Enabling for creativity

The workshop was partly inspired from Bødker et al. (1993) and their idea of cooperative design. Themes that were inspiring were: developing an understanding as designer, a problem inventory and mock-up design. This grounded for building up the workshop as different phases, each of them having a clear goal and outcome. One of the greatest possibilities with the cooperative design approach was, as I see it, that the object was created and developed with starting point in the users themselves and thus it came from within. This set for the first and second corner stones in the workshop. The constellation of the workshop methods was inspired by Muller et al. (1993) and their method chart. In the work of selecting methods, Brandt and Grunnet (2000) were inspiring: “In user centred design it is important to be creative and to be able to explore the context of use and the artefact from new perspectives in collaboration with users (Brandt and Grunnet, 2000, p 1).” Thus, emphasis was put on methods that would open up for creative thinking and creative acting, and thereby constituting the third corner stone in the workshop. Furthermore, as Bødker et al. (1993) mean, it is important that the users are provided with tools that they are familiar with. In this context it meant that the participants were to use their own ways of expression; those who usually expressed themselves through sketching or writing could do that, and so forth. In this sense the exact content in the workshops was shaped when knowing how they usually expressed themselves (which was found out during the interviews). The workshop was composed with starting point in the participants and their knowledge about the field and understanding of design.



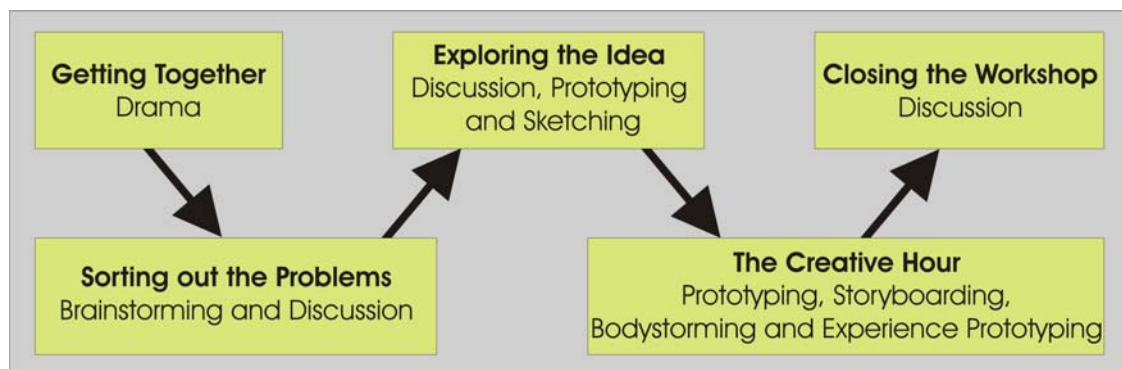
A workshop not only requires a well planned working-way and carefully selected methods, but also a consideration and preparation on possible problems that might occur

during the work. Possible overall problems that could occur in the workshop were divided from those Bødker et al. (1993) present, due to the different conditions. On the other hand there were private persons that were gathered and brought together. This could set for other problems. However, most of the participants knew each other from before. This was an advantage in this context, since they could act as a group from the start. It was also possible that they could relax, and did not have to put effort in socialising as one might do the first time one meet each other. This also could ground for speaking more freely when already knowing each other. The fact that some of them knew each other could, on the other hand, result in speaking about subjects irrelevant to the workshop and loose steering-way. Another dimension related to this, was that I had during the interviews, e-mails and telephone calls already created a relationship with the participants which was considered being important for the workshop. Those who did not know someone else did know me. The problems were also divided from the often recurrent ones that Kyng (1994) presents. Here was a clearly defined user group, and there was no design team to consider regarding various opinions about user participation. It could be quite intense both for me and the participants, which could lead to a limitation in the time aspect of the learning process.

Five persons participated in the workshop; four women and one man. They had all been interviewed at an earlier stage in the case study. This was considered being a small group (Muller et al., 1993). The workshop was documented with a video camera and a digital camera with permission from the users. The workshop lasted for 3 hours. The workshop took place in a room at a library. The library was chosen due to its neutral atmosphere.

### 3.4.1 The Workshop: Phase by Phase, Method by Method

The aim with the workshop was to enable a creative environment to generate and develop new ideas with starting point in scoliosis and everyday life, and in this way collaboratively create a design concept that would fit persons with scoliosis and their everyday life. The workshop constituted of five phases: *Getting Together*, *Sorting out the Problems*, *Exploring the Idea*, *The Creative Hour*, and *Closing the Workshop*. Figure 5 shows how the workshop was planned with phases and methods.



**Figure 5.** The workshop showing the chronological order with phases and methods.

### **3.4.1.1 Getting Together: Drama**

In the first phase *Getting Together* the goal was to open up the workshop through socialising and getting to know each other. Drama was used to do that. Drama can be used in design contexts in various ways (see Brandt and Grunnet, 2000; Buchenau and Suri, 2000). A drama exercise “The story of your name” was used. In this exercise the participants are presented to each other with a story through telling a story about or connected to ones name.

### **3.4.1.2 Sorting out the Problems: Brainstorming and Discussion**

In the second phase *Sorting out the Problems* the aim was to make an inventory of the everyday problems that the participants experienced that scoliosis brought, and sorting them out to find a starting point for further work. Brainstorming and discussions were used to accomplish that. Through this choice the workshop was initially problem oriented. The reason was that the participants had expressed several problems connected to scoliosis and everyday life during the interviews. Since the scope for the case study was to develop something for scoliosis and everyday life, starting at the problems seemed reasonable.

In brainstorming everyone contributes with ideas. It is important not to criticize (Jones, 1992). Jones (1992) means that the goal is ”To stimulate a group of people to produce many ideas quickly (Jones, 2002, p 274).” The brainstorming session was modified in the workshop. It was used as more of an investigation or inventory of already existing problems. Yet the term “brainstorming” was chosen as a description on the session. It was interpreted as being a more well-known concept for the participants than the phrase “problem inventory”. The brainstorming was based on pen and paper. The problems were categorized and put together on a large paper. The problems were ventilated, and a problem was chosen to work further on through a discussion. The idea behind using discussion at this stage was that it came naturally. It would have been possible that using another method would have broken the natural flow of how problems are handled as they are brought up. It was assumed that discussing the problems after mentioning them was the most natural. In this way the experiences and opinions naturally ventilated were taken advantage of. The discussion was expected to end in a decision on which problem to work further on.

### **3.4.1.3 Exploring the Idea: Discussion, Prototyping and Sketching**

In the third phase *Exploring the Idea* the problem chosen was to be transformed into an idea, which in its turn was to be explored. That was made through discussions, supported by Prototyping and Sketching.

The reason to have a discussion was that decisions had to be made on choosing problem and on how to tackle it. Many people had to agree. It was then most natural to have a discussion on that. Expected result in the discussions was that they set direction on the work. Prototypes “are created to inform both design process and design decisions [...] to explore and communicate propositions about the design and its context (Buchenau and Suri, 2000, p 424)”. Ehn and Kyng (1981), who talk in terms of mock-ups, argue that “...they actually help users and designers transcend the borders of reality and imagine the

impossible (Ehn and Kyng, 1981, p 172). ” This was important in this study. Due to its strong focus on exploration (Kyng, 1995), mock-up was chosen to work with, which suited the phase. It was considered being suitable for a creative reason. No distinction was made in the workshop between the terms mock-ups and prototypes. Houde and Hills’ (1997) view was used as basis, who “... define *prototype* as any representation of a design idea, regardless of medium (Houde and Hill, 1997, p 3). ” In this sense no distinction could be made. As material for the prototyping clay was chosen. Clay is a material that can be remodelled over and over again, and it can be used to create three dimensional models. Expected result with the prototyping was visualising and communicating ones views on the idea within the group, which was to increase the understanding of the idea. Sketches belong to the category of prototypes (Buchenau and Suri, 2000). Sketching was primarily used as a complement to the discussions. As the idea evolved, the participants were asked to sketch what they had explained. In this way the sketches were used as fortifying and clarifying tools, as well as reminders on what was said at an earlier stage, which also was the expected result.

#### **3.4.1.4 The Creative Hour: Prototyping, Storyboarding, Bodystorming and Experience Prototyping**

The fourth phase was *The Creative Hour*, where the idea was developed and visualised. The thought behind using Prototyping, Storyboarding, Bodystorming, and Experience Prototyping as methods was that they represented different ways of visualising the idea. They were complementing each other in this combination.

The goal with the Prototyping at this stage was to create a prototype that the whole group could engage in and gather around and in this way create a tangible prototype that could stand as a representation of the idea. This prototype was then to be used as a starting point in the Storyboarding and the Bodystorming and Experience Prototyping. In Storyboarding, a series of sketches shows for instance how the object developed is used (Preece et al., 2002). In the workshop, a paper with empty squares with empty lines underneath was prepared. The squares were for the sketches and the lines for the belonging text. A task on what the storyboard could contain was also prepared. Storyboarding was chosen as a complement to the Bodystorming and Experience Prototyping for those who not wanted to play drama (the methods were conducted simultaneously). Additionally, it was chosen due to its characteristics to write and sketch on a limited space, which forced the participant to consider and reflect on what to include and what to exclude. Expected result was issues that the participants found important. A combination of Bodystorming and Experience Prototyping was used. Experience Prototyping was interesting in the sense that it draws attention to the experience one is designing for (Buchenau and Suri, 2000), rather than the object. This was an important notion in this context, since everyday life was here seen more as experiences than objects. “Experience Prototyping can provide inspiration, confirmation or rejection of ideas based upon the quality of experience they gender”, Buchenau and Suri (2000, p 431) argue. Bodystorming (Oulasvirta, 2003) was used to enable improvisation and exploration with the body of how to visualise the experience and the idea. It was also used as a mean of how to communicate their view and experience to the others. Expected result was a shared view on the idea.

### 3.4.1.5 Closing the Workshop: Discussion

In the fifth phase *Closing the Workshop* the workshop was summarized and concluded with a discussion on the workshop and on the concept. Expected result was an overview of opinions on the concept and the workshop.

## 3.5 Analysis

### 3.5.1 Try it Yourself

The dairy was read several times to understand the meaning of the dairy. It was analysed in the way that meaning units were identified, and denominated as different sub themes. Sub themes with similar content were grouped, and different themes emerged.

### 3.5.2 The Qualitative Interviews

The interviews were analysed with starting point in interaction. In this study interaction means each participant's relations and connections to the life situation. Thus, past and present experiences and thoughts about future were in focus. Each interview was read several times in order to obtain a comprehensive understanding. After that, every interview was divided into meaning units, denominated as different sub themes. The sub themes were compared regarding similarities and differences. Similar sub themes were sorted and themes were formulated. To get an overview of the data belonging to the sub themes and themes, a scheme was created (see Figure 6). In the scheme the themes and the sub themes were placed on one axis and the participants on the other. In this way a grid was created. Through reading the scheme vertically one can follow each participant related to the formulated themes and sub themes. When reading the scheme horizontally a composite view of each theme and code was achieved. This helped me in the analysis process.



Figure 6. The analysis scheme

### 3.5.3 The Workshop

The data from the workshop consists of two video tapes, notes, sketches, a poster and a prototype created during the workshop. The analysis was composed of two main tracks. The first track was to find the critical turning points in the video tapes that lead to the design concept. The other track was to investigate the methods and their possible contribution to the design concept.

The video tapes were the basis for the analysis. First the video tapes were viewed several times in order to understand and to get an overall comprehension of the design concept. After that the video tapes were viewed again and notes were taken concerning the workshop as a whole. The notes were read and the following questions emerged as important for guiding and continuing the analysis:

- The concept
  - Which were the critical turning points that lead to the design concept?
  - What were the critical turning points about?
- The methods
  - How did the methods contribute to the design concept?
  - Which data/information was given through which method?

The questions above were used in order to maintain focus in the analysis. The questions on the design concept concerned everyday aspects. The questions on the methods were directed towards their influence on the design concept. During the viewings notes were taken on events according to the questions above. Notes were also taken regarding the events in the tapes which concerned the produced material. The notes were read and the critical turning points were thematized.

## 4. Results

The results are presented according to the headings: the designer creates an understanding and the designer and the participants create a design concept.

### ***4.1 The Designer Creates an Understanding***

In this subchapter the results from Try it Yourself and the qualitative interviews are presented.

#### **4.1.1 Try it Yourself**

The themes that crystallised from the material were:

- **Practical Problems**
- **Experiences for Body and Mind**
- **The Designers' Dilemma**

**Practical Problems** were that it was hard to lean down and that I felt stiff in the situations when I had to be physical. Another practical problem was to go to the toilet. Since the brace went down on the buttocks I had to be very careful in that situation. The brace leant on the hips. It began to hurt particular on one hip. Furthermore my breasts did not fit in the brace.

**Experiences for Body and Mind** was about how my body felt and what I thought about the situation. After half an hour of use I felt panicked with a touch of claustrophobia. I thought that it was hard to breath and felt how my stomach was constantly pressed in. I experienced the brace as being a shell. After a few hours I experienced a transformation on this level - I had forgotten all about the brace. I did not longer feel the brace nor reflected over it. When I was going to sleep I had my doubts, since I did not feel relaxed as I normally did. After one and a half day my back started to hurt.

**The Designers' Dilemma** occurred during the second day. When my back started to hurt I did no longer see the point in wearing the brace. I questioned why I did this experiment

and what the point really was. I tried to convince myself with the argument that it was “all for the design”. It worked for a while. Eventually I kept throwing myself between taking the brace off and on. I took it on with the argument for my study and that I had to go through this in order to get closer to some kind of understanding, and taking it off when I completely lost motivation due to my back. The experiment ended in the afternoon on the third day and I took the brace off and put it in the wardrobe.

#### **4.1.2 The Qualitative Interviews**

Six themes and belonging sub themes were identified in the material:

- **Me and Myself**
- **The Scoliosis**
- **Everyday Life**
- **Close Relations**
- **Social Contexts**
- **The Society**

##### **4.1.2.1 Me and Myself**

The theme **Me and Myself** incorporated the sub themes *thoughts about life*, *thoughts about the body*, *to be different/to be like everyone else*, and *self image*. This theme had oneself as a starting point, where thoughts and attitudes concerning oneself were expressed.

Regarding *thoughts about life*, basic aspects were accepting or not accepting the life situation, which brought thoughts about life. Those who expressed an acceptance over their life situation talked about having a good health, a good life and living like every one else. A meant that one have to live with scoliosis and that the though part, which was the long hospital visits and the brace wearing in the youth, was now as left behind. It was also about the process going through in accepting the life situation with scoliosis, and how a feeling of inferiority had shaped a persons life. The aspect on not accepting the life situation was centred on not apprehending life as normal. One opinion was that it was only built around health care. Another was a regret over that the only life you get becomes like this. This sub theme is connected to the theme **The Scoliosis** and the sub theme *adjustment to the sickness*, which is presented below. This implies that how the person relates to her life and her life situation has to do with the adjustment to the sickness. These two are closely connected.

*Thoughts about the body* dealt with the relationship to the own body, and then primarily about what was seen as “differing from the norm”. The participants had different ways to relate to their own body. It was all from seeing the scoliosis as “cosmetics” to not being embarrassed over it, from feeling ashamed over certain parts of the body and seeing the body as repulsive to hiding the scoliosis. The scoliosis was apprehended by one person as a depressing factor in bodily contact. *Thoughts about the body* was also concerning the body in terms of what did not longer function as usual. One interpretation of these different views and relations to the own body can be that they are connected with the societys’ view on the body and to others’ view of a person with a body that differs from

their own. These might have been affecting factors. From this point of view there are connections to **Social Contexts** and **The Society**.

*To be different/to be like everyone else.* In this sub theme feeling different in the childhood or youth was recurrent. It was about not being given the opportunity to create contact with other children in a normal way or about isolating oneself as a teenager and then not “get on the right track”. It was also about using fashion as a youth to point at similarities with others. As a grown-up it was at one hand about the feeling of not being counted with like everyone else. At the other hand it was also about being like everyone else. This sub theme is connected to **Social Contexts** in the way that feeling different or not can be put in relation to how others behave or are towards oneself.

*Self image* was about the person and her view of herself. There was a downhearted attitude, focusing on being handicapped but not wanting to be it, as well as an optimistic self image, focusing on not seeing oneself as a sick person. There was also a self image on being more feminine and attractive nowadays, compared to earlier in life.

#### **4.1.2.2 The Scoliosis**

This theme incorporated the sub themes *adjustment to the sickness* and *the sickness in general*.

Recurrent views were adjustment or not to scoliosis. Regarding adjusting to the scoliosis A meant that:

...then the older you get you learn to live with it.

On this E said:

Because I, I... forget that I have it. Because I've never had anything else and then eh...it doesn't engage me (laughter) so much. More than eh I I notice when I get tired.

The process going through in adjusting to the scoliosis was also brought up. On not adjusting to scoliosis an unacceptance of the sickness was expressed. Scoliosis was seen as preventing from doing many practical things or as a burden both to one self and to the surrounding. As mentioned above in the theme **Me and Myself**, *adjustment to the sickness* was connected to how one saw upon life. The close connection tells us that scoliosis is a part of oneself, whether one has adjusted to it or not, and whether one have accepted it or not.

In *the sickness in general* the person's different degrees of scoliosis, and other eventual diagnosis were brought up.

#### **4.1.2.3 Everyday Life**

In this theme the sub themes *spare time*, *home*, *everyday things* and *everyday situations* were found.

The *spare time* was filled with all from singing, training, working in a non-profit making association, travelling, going to the theatre, reading, taking university courses, resting, walking the dogs, sewing, and playing bocca. A second sub theme was the *home*. It was discussed and described with starting point in the *everyday things* that they had in their homes, but also what they did in their homes. The home was for instance a place for doing nothing, engaging in hobbies, resting, eating, sleeping, and as a meeting place. A proudness was expressed over having certain things, such as electricity driven chair, adjusted car, breathing machine, brace, electricity driven bed and other technical things. Different views on these everyday things were expressed. The views were about being focused on what was not working in the wanted way, and it was about being pleased over them and not wanting to be without them. To save things that had a history and were attached with certain memories was also brought up.

*Everyday situations* were those situations that occurred on a regular basis. It was described as what happened when during the week, for instance having assistance by persons. It was also described with starting point in everyday situations that used to be, compared to everyday situations from the moment being, for instance from the time when working and from now being sick-listed or retired. Additionally it was described as being what happened during a day from morning until night. An *everyday situation* was filled with *spare time*, *home* and the *everyday things* in the home. In the *everyday situation* the home acted as the corner stone and starting point. This can be connected to the context in which the interviews took place, which was in a home environment in four of the cases. For those having a work, the work also constituted a corner stone together with the home.

#### 4.1.2.4 Close Relations

**Close Relations** included *family*, *mother*, *father*, *siblings*, *children* and *partner*. This theme described the different relations the participants had to persons close to them. It was also about how these persons had affected them, and about the support or non-support that these persons gave them.

Support was for instance described as parents buying fashionable clothing, partners being there for them, a father serving and being there, parent fighting for their child's rights to go to regular school or fighting for getting a school transport. Non-support was described as not been given as a child the closeness needed from parents, and parents being ashamed over the disability.

It was also described how the parents affected them in the sense of how parents handled their own disabilities. D's father affected her attitude towards her own disability:

Yeah, I've thought about that actually afterwards that my dad he had only one eye. So he has a prosthesis in that that eye. And hm....that that is nothing that he, I've known it. But it has never been so open that he talked about it or showed how it looks or...so he. It has probably been a very sensitive thing for him. That differentiating thing. And and I thought that if he had been more open with his eh... defects and weaknesses so...that can be a small, very small bit in the whole [...] So it has been a bit more like hiding...stuff.

It was also described in terms of how a mother fixated on sicknesses made a big deal of her child's scoliosis, which brought a thought that everyone else reacted the same way on the scoliosis as the mother did.

In this theme it was also expressed a satisfaction over the current family situation or a dissatisfaction over not having an own family. It was also described how different sex partners in the youth was used for processing bodily issues to prove that by seducing the other sex, the body was not completely useless.

There is an intercorrelation between this theme and the theme **The Scoliosis** and the sub theme *adjustment to the sickness*. There is a tendency that what the close relations looked like and in what way these persons affected the person, also had effect on how the person adjusted to the sickness. If the person through the close relations, for instance parents, were supported in dealing with the scoliosis and the life situation this person also expressed an acceptance of the scoliosis. However, too few interviews were made to clearly state this fact.

#### 4.1.2.5 Social Contexts

This theme is built of *friends*, *the surrounding/other people* and *social relations*.

On *friends* there were different strategies and attitudes. There was an attitude that there existed a difference between having old friends and making new ones. In the relationship with old friends the scoliosis was unimportant, and when making new ones the scoliosis became a barrier, in the sense that weaknesses and disabilities had to be exposed to new people. One strategy on the friends issue was that never letting or allowing the scoliosis to play a role at all in the having or making of friends. A second strategy was to find friends in contexts where the bodily prerequisites were unimportant. It was stated that it was apprehended as being positive to have friends who were in the same situation as one self.

*The surrounding/other people* brought out if and how other people had reacted on their scoliosis. It could be people staring or commenting, or children asking questions. Mobbing and outsidership at school was described. It could also be people not reacting on the scoliosis but at the other hand reacting on other eventual disabilities. In this sub theme, social context on meeting new people was also emphasized, where it was apprehended that new people rather made contact with other new people. D explained:

I mean that you...that they are...they, for p, for other people that maybe just see me the first time like that. They make in most cases not contact. Not in the same way like you do with other unknown people. But they rather choose someone else [...] But I feel like I have in a way... show that I am...show who I am. [...] yeah I work, I drive a car or yeah... I am somebody. I have an education. I am eh... not completely stupid. But eh...you you have in some way, in someway bring out yourself eh... so they then get another picture of that eh...short eh... girl with with back deformity.

*Social relations* was connected to *friends*, in the way that the social relations to a great extent were constituted of friends, who were an important part of the social relationship.

In this sub theme, however, it was pointed at what was problematic in social relations. It could be: never being given the opportunity to train in social situation, or not get the normal social contact with others from the start as a child, or mismanaging social contacts as a grown-up.

#### 4.1.2.6 The Society

The theme **The Society** constituted of *health care, school, work, fashion, society in general, politics, and authorities*.

*Health care* was about how the participants experienced health care in their childhood and teenage as well as today. Experiences from childhood considered as abuse were being described. It was about not being attended regularly when living at hospital, punished when not wanting to eat, or being neglected and talked-over-the-head during scoliosis investigations. These experiences had affected their view on health care today; having a dreadful first memory in life, but being positive towards health care today, and to loosing faith in doctors, and having a negative view on health care, especially doctors, today. This sub theme also incorporated the role that health care played in life. As B put it:

So my whole life circulates around a health care [...] that feels eh...like what should I say a urgent necessity.

In the sub theme *School*, being different at school compared with other children in terms of mobbing or outsidership was outspoken. The outsidership was on one hand created from the schools' side by not letting the person sit in the same classroom as other children, and on the other hand being initiated by the person self by isolating and not participate in activities in school such as school dances. The outsidership was also sustained by other children at school. *School* was also about how to manage the years at school; making a flying start and take up all what was missed during years at hospital, or about mismanaging school by being occupied in being accepted. *School* has a connection with **Social Contexts**. *School* can be seen as a social situation where relationships with other people and friends are created and sustained.

*Work* was about what work meant in life. In one case it meant everything and giving a feeling of doing something important and feeling needed. *Work* was also about experiencing ergonomic problems at work, such as sitting comfort or having the wrong kind of work.

There were issues on *fashion*. One aspect on *fashion* was on the identity. Looking good as a teenager, despite the back and the brace, and hiding the scoliosis were emphasised, as well as using fashion to point at similarities with others. Fashion as identity was also used to differentiate from others, but also for identity shaping. A second aspect on *fashion* was the lack of fashion and not finding fitting clothes. There was no fashion for teenagers when they grew up, which set for problems. It was a hard time finding clothes and shoes. D explained:

Yes, normally, I mean that you have eh...a youth and so and you have a lot of friends. And is out having fun. And...and are out dancing and so on. And I didn't participate in that at all, but I was very isolated. [...] But, eh... no, it went wrong already from the beginning. [...] and and it was like people nagging on me to... to come along now, let's go to this, but I just. You know, I didn't have clothes. Just something like finding a shoe in size 33. You had...where do you find a shoe with a heel? It was like a huge worry. But in some way it was solved for...for confirmation, and intermediate school-leave examination and higher school examination.

C also described the fashion aspect:

[...] I didn't...have the same opportunity as maybe others have to walk in to a ready-made clothing store or participate in a sort of...fashionable...eh...yeah, stay in trend, but eh. [...] And so I might have been a more differentiating person for the reason that it hasn't been so simple and available to renew eh... this with the the wardrobe or trendiness or what ever it can be called.

Today the problem was more of a clothing problem than primarily a fashion problem. The lack of fitting clothes was central. Rearranging with different pads and resewing clothes were strategies mentioned to deal with this problem. A wish of having clothing made exactly for the body was expressed. B said:

But I... still would like to...eh... to have eh... even more beautiful clothes [...] or clothes that fit better [...]. Or clothes that fit me where it wasn't visible that much.

*Society in general, authorities and politics* are closely connected. They were all involved in life in various ways. It was on having assistance from people, which had to be planned long time in advance and in turn forcing to planning life in advance. As a child, there were no aids for disabled persons or child maintenance allowance available. This can be considered a *political* issue as well, just as the fact that there was no school transports. It was also about how parents were encouraged by *authorities* to put their child in a boarding school for disabled children, mediating a view that people with different bodies should be treated differently and differentiated in society. *Authorities* had opinions on choices of education and future occupation, and wanted to steer the choices on this. Another point was made by F:

[...] looking differently is actually not a problem. But it becomes in society, so to speak.

#### **4.1.2.7 Summary**

In the theme **Me and Myself** thoughts and attitudes concerning oneself were the starting point. In the theme **The Scoliosis** the main issue was on adjusting to the sickness or not. A close relationship was found between accepting the life situation or not (theme **Me and Myself**) and adjusting to the sickness or not. This tells us that scoliosis is a part of oneself. In **Everyday Life** the home, everyday things, everyday situations and spare time was central. In **Close Relations** these relations were brought up, as well as how these persons had affected them and given support/nosupport. A tendency was seen that what these relationships looked like and how they affected the person had a relation to how they adjusted to the sickness (theme **The Scoliosis**). The theme **Social Contexts**

concerned the having and making of friends and how others had reacted on their scoliosis. **The Society** dealt with various institutions present in life, and aspects and experiences on school, work and fashion. Then, what can these themes tell us? Some points can be made. The scoliosis is always there, whether one wants it or not. One is like everyone else, but still not. The body and body functions, for instance pain, are prominent. These three aspects are significant with respect to everyday life aspects, and were important to bring into the workshop.

## 4.2 The Workshop: The Participants and the Designer Create a Design Concept

In this subchapter the results from the workshop is presented.

### 4.2.1 Getting Together

We started with the drama exercise “The story of your name”. This did not in itself contribute to the design, but was important for social reasons. This was appreciated, to tell from the many laughs.

### 4.2.2 Sorting out the Problems

The participants were divided into two groups in a brainstorming session. They were asked to write down all the problems that they experienced in their everyday life that were connected to scoliosis; problems that their scoliosis brought (see Figure 7a). The groups presented their problems and in some cases there were instant discussions on a problem. We categorized the problems on a large paper (see Figure 7b). The categories were:

- *Ergonomics*: sitting uncomfortable, posture, ergonomics at the working place, beds, training machines, cinema chairs, hitting the hunch.
- *The body*: balance, the balance makes it hard to reach things, breathing, the breathing machine, not go out for certain walks due to the compressed lung, not be able to swim due to the lungs, weakness in the muscles due to the scoliosis, pain: while walking, ironing and standing still for a long period of time, different length in arms, uneven hips, the hunch, pressure on nerves, press sensitive on the



Figure 7a. Some of the problems written down.

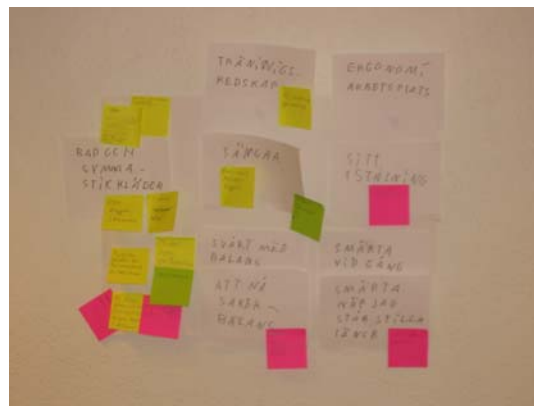


Figure 7b. The categorized problems.

- body, psychological problems due to being different as a child, shame to show the body.
- *Clothes*: bathing suit and working-out clothes, costume/clothes: ready-made clothing and tailoring, get stuck with sleeves in door handles.

There were also correlations between the categories. Afterwards the participants were asked to give their opinion on which problem they wanted to work further on. They emphasized two main problems; ergonomic problems in sitting position and clothes that do not fit their bodies. They ventilated what the sitting problem was like: the hunch, and for some also the uneven hips, made it hard to find a comfortable sitting position. The hunch had to be relieved. As a suggestion from B this could be realised by building up the lower part with some kind of padding. In this way an even pressure on the back could be created. This suggestion was based on how they had solved the problem today, which was further explained. That was *the first critical turning point*, focusing on **use today**. They were talking about that they brought cushions, both inflatable and regular, if they were going somewhere. About cushions B said:

OK, it's hard to drag about with you, but it facilitates if you're is going somewhere, to the cinema, to the theatre or visiting someone.

He was sitting on two cushions during the workshop, but was not sitting comfortable anyway. The need for a footrest was also expressed. They never brought it since it was too hard, which in much was the same for cushions. Creating own small pads, cut out from pads provided by Hjälpmedelscentralen<sup>7</sup> was mentioned as one way to handle the sitting problem. The cushions were put in bags. In this way no one else could see that it actually was to be used as an aid. Regarding the pads that are provided today F saw them as boring, ugly, attention drawing and there is something embarrassing over them. These different ways to handle the problem gave a perspective on it. This inventory started a process. *The second critical turning point*, which was focused on **need**, occurred in the end of the brainstorming session. E and F established the fact that there is nothing today that is adjusted to the individual. This statement set for further thoughts in that direction – to develop something that can fit the body individually. A decision was taken to combine the two problems. F said that she was thinking of pads that were attached to the clothes, maybe to some kind of vest. This was *the third critical turning point*, centred on **an idea**, in the sense that it was the vest idea that was chosen to work further on.

The brainstorming contributed to the design concept in the sense that the participants found problems, and were able to concretize them and put words on them. Through the discussions on the problems, we came up with an idea that we wanted to realise. The themes in the critical turning points; **use today**, **need** and **an idea**, were connected to the given task, which was problem oriented.

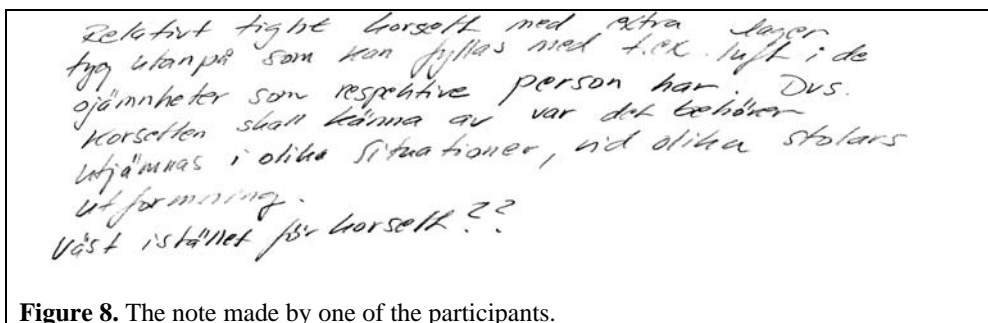
### 4.2.3 Exploring the Idea

The workshop continued with discussions on the vest idea. The participants analysed how they were sitting, something they normally were not thinking of. They discovered that

---

<sup>7</sup> Approximately translated into The Centrum for Aid.

they were all different in the scoliosis and the hips, a fact that would affect how the vest was going to work and look. This was *the first critical turning point*, focusing on **the person and her body**. It was concluded that the lower part on the back had to be filled up and that the unevenness in the hips had to be adjusted. The vest idea was further processed. F was given Play-Doh to visualise her view on the vest in a prototype (the model did not become as she wanted and she destroyed it; the clay was too soft to work with). *The second critical turning point* aroused. It was centred on **functions**. F explained that she was thinking that the vest could have a pad inside, for sitting on, which could be pulled out with a string. A section on the lower part of the back was also to be activated. A new idea on having a neck rest was added to the vest. A discussion on materials was initiated; chemical, electrical, air, foam plastic and so forth. The material had to expand fast and had to be small initially. D emphasised the point that there had to be two layers in the vest; one tight brace-like that could be filled out which was attached to one loose layer outside. D wrote down a description on her view on the vest: “A relatively tight brace with an extra layer of cloth outside that can be filled with for instance air in the unevenness that the person has. The brace shall feel where it has to be filled out, in different situation, in different form of the chairs. Vest instead of brace??” (see Figure 8). D’s note was also describing a technical aspect on the vest idea. It should be self feeling, and know where to expand on the body and not, she meant. *The third critical turning*



**Figure 8.** The note made by one of the participants.

*point*, which was focused on **form**, occurred when we investigated and considered using a brace-like vest under the clothes. This idea was not paid attention, even though it was discussed. B meant that a loose vest to put on extra is better, because then you are not tied up to the brace. It was also stated that they did not want to have something that constantly filled out the lower part of the back. F said about her body:

I will not go around and be ashamed for this. That time is gone.

They cared more about that issue when they were younger. This resulted in a fortification in using a loose vest to put over the clothes that could be activated when wanted, and not have something constantly re-forming the shape of the body.

The discussions contributed to the design concept in the way that different views and aspects on the idea came up. The ideas and aspects within the vest idea were further developed in the Prototyping in the next phase. The discussions became an important in-between step and served as a foundation for the Prototyping. Since the clay was too soft to work with, the prototype at this phase became more a discussion as well. D who was

asked to make sketches on her view chose to write instead, which was just as suitable, since it became a reminder of the discussions we had. The information given in this phase was connected to the themes in the critical turning points; **the person and her body, functions and form.**

#### 4.2.4 The Creative Hour

Now we went into the creative hour, in which the main target was to visualise the vest idea. Prototyping, Storyboarding, Bodystorming and Experience Prototyping were used as main methods. *The first critical turning point*, where **the person and her body** was central, came up immediately. The individually bodily prerequisites brought up a questioning of using a vest at all. For a person with scoliosis the shoulders can be in different heights, due to the spinal curve. This can make a vest hard to wear. We were trying different ways to explore the vest; could it be more like a poncho or could the material be removable so you can move it between different clothes? We eventually returned to the vest with fixed material, after deciding that the shoulder problem could be solved with shoulder pads. This exploration was reinforcing the vest and it was taking a clearer and a more united shape in our minds. *The second critical turning point*, which was on **form**, raised from the first critical turning point. E started on a prototype on the vest in cloth (see Figure 9a). This brought discussions on how it could be crafted and formed. E, who was a dressmaker, described how the vest could be formed in order to fit the hunch and other individual needs, such as the shoulders. E meant that it was a form issue to make a fitting vest. This incorporated a certainty that the vest could be fitting a person with scoliosis. The next and *third critical turning point* focused on **functions**. F made a sketch (see Figure 10a) on how the vest could be formed with focus on the sitting pad. This started a discussion on what kind of command that would activate the sitting pad: strap, button, speech or touch? Further more, it was stated that the material could not be temperature sensitive. The vest could be a programmed system that sensed where the material on the back should expand and not. The ready prototype (see Figures 9b and 9c) was *the fourth critical turning point*. Here, both **functions and form** were central. The prototype served as a tool for further discussions and explanations. It helped in creating one view on the vest. The prototype visualised how the vest could work. F draw yet



**Figure 9a.** Making the vest prototype.

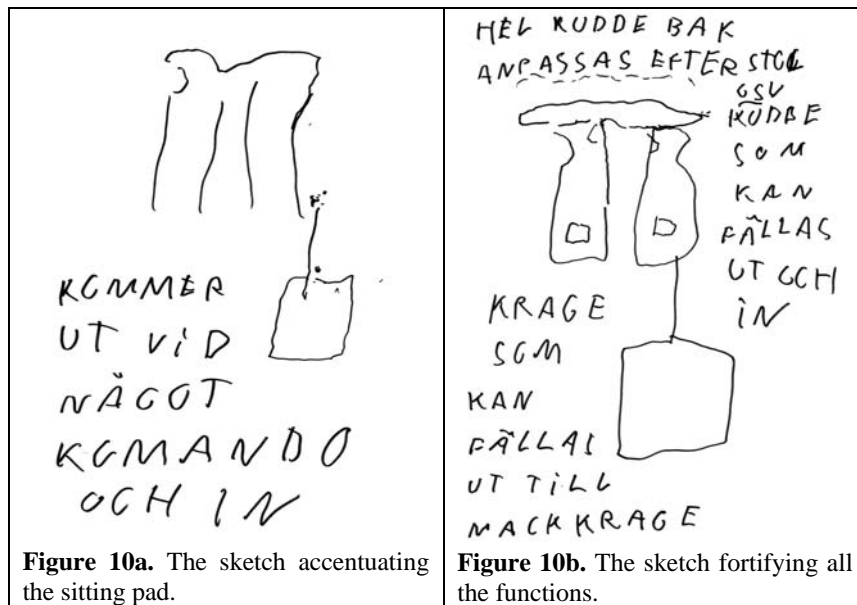


**Figure 9b.** The ready vest prototype.



**Figure 9c.** The ready vest prototype.

another sketch to fortify the functions (see Figure 10b). It was stated that the material had to be flat from the beginning and be placed on the whole back. When it expanded the material expanded more on the lower part, but also on the hunch. This was related to the fact that the peek of the hunch took the most of the pressure. A pressure that then could be removed. The material then became an even surface on the back seen from outside. It was important that the vest should look like an ordinary vest and that it should be used for as much as possible.



As the prototype was finished, the participants were divided into two groups. One group was doing Bodystorming and Experience Prototyping, visualising the vest. The other group made a Storyboard, also visualising the vest. The two groups were given the same task: to visualise how the vest was used, how it felt wearing it, how it worked, what the material it was like and how the vest was experienced. In the Bodystorming and Experience Prototyping group there was full body action. *The fifth critical turning point* occurred, dealing with **experience**. They emphasised some interesting points in their drama. The drama took place at a theatre that they were visiting. It was comfortable to use the vest and one could now sit in a relaxing way. The material in the vest was smooth and soft. There will be many steps to handle and keep in mind when activating and deactivating the vest. There must not be any confusion about which (in this case) button that was connected to which function. One must not forget to deactivate for instance the sitting pad, otherwise one will walk around with a pad hanging down from the vest. The Storyboarding group created a strip also on an event on the theatre (see Appendix B). They emphasised that it was a new material that reacted on programming code, and that it should be activated and deactivated when wanted. Using this vest resulted in a pain free experience at the theatre. A reaction on the storyboard was that the vest cannot make an attention drawing noise.

The Prototyping contributed to the design concept in the way that it served, as described, as a tool for discussions and explanations. The concrete prototype helped in creating one

view on the vest, as well as it helped in making the idea tangible. In this phase sketches were made. They acted as complements to the prototype and stood for those functions that the prototype could not show or express. The Bodystorming and Experience Prototyping contributed to the design concept in the way that through letting the body experiencing the vest issues could arise. The vest concept could also mature in terms of what kind of experience and expressions they wanted the vest to have. The storyboard contributed to the design concept through underlining aspects that the participants found central. The storyboard also rose comments not thought of before. The themes in the critical turning points were the same as in the phase before with one addition; **the person and her body, functions, form and experience**. The alternation between the themes became obvious, in the sense that they were recurrent. The information given in this phase was connected to the focus in the critical turning points; **the person and her body, form, functions and experience**.

#### 4.2.5 Closing the Workshop

The workshop was concluded with a discussion on the concept and the workshop. Regarding the concept we had created, it was stated that it was not obvious that they would use the vest if it existed in reality. They thought that they would use it if it fit the clothes that one normally wears, if it looked good, if it felt good, if the vest helped, and if it could be used everywhere. This was *the first critical turning point*, which was about the **meaningfulness** of the vest. It was positive, meant F, that the vest would not look like an aid. She apprehended them as being boring, ugly, attention drawing and embarrassing. The vest would instead be good-looking, fun, and not have the logo “Landstinget”<sup>8</sup>. This view pointed out how the form of an artefact sends out certain signals. On the whole they thought that it was difficult to grasp what kind of material that could be used in the vest. B said:

[...] there is so much mathematics and computing that one nowadays can put in new materials that didn't exist in our time. So we're stuck in all that with pads and so on and don't think on anything else. And that's where you come with new ideas.

Regarding the workshop D said:

When I went here I didn't understand what we were going to do or what we could contribute with, but...oh, and then it actually became something, which both surprises me and is fun as well.

#### 4.2.6 Summary

Initially, the participants were focusing on their **use today** and what **needs** they had, which ended in **an idea** for a design concept. In creating and developing the design concept the participants used themselves and their own bodies as starting points in the design. **Form** and **functions** were also recurrent aspects throughout the work. They turned between the three themes **the person and her body, functions and form** in the process. This tells us that these three aspects were complementing each other in creating an understanding and the formation of the idea. Outermost **experiences** were accentuated.

---

<sup>8</sup> “Landstinget” can be translated approximately into the County Council.

It turned out to be the **meaningfulness** that was the foundation in whether the vest was to be used or not if it would exist in reality.

## **5. Discussion**

In this chapter the result is discussed, followed by a discussion on the methods. Furthermore further work is suggested. The chapter ends with conclusions.

### **5.1 Result Discussion**

It is appropriate at this state to expand the perspective by bringing in some reflections on the theoretical framework. Computational technology as a design material was at first hand interpreted as a point of view. More concretely it was used as a mean to trigger a way of thinking, rather than a physical material at hand to experiment with. Thinking freely about a material that is unknown can bring a reflective attitude over feelings, experiences, and conceptions that could be connected to this unknown material, as well as shapes, behaviours, forms and functions that could appear from imagining about the material. An embodiment of the material can be created. The computational technology was here interpreted as having different dimensions, and thus hint at what possible could be inherent in it as a material. Designing with dimensions as such might require visualisation techniques in the design process in order to concretize the abstract. This way of relating to computational technology as a design material can at some points be abstract, but challenges the imagination and our pre-understandings on what materials like this could be like or even what a material is. Focusing on an objects' presence, attention and focus in the work of design has to be on something beyond the physical thing that is to be created. With this mindset the person and what she bears inside becomes a prerequisite for how she will receive the thing and whether she will bring it in her lifeworld or not. It is then of vital importance to get an insight in what this internal can be if the thing is to have a meaningful presence in life. Aesthetics as a base in design then becomes necessary. This attitude is guiding the process of designing something that is not yet here to be used and to be present in our lives.

When raising one's eye from the case study three main issues in particular discern, which need to be brought up for discussion; meaningfulness, form, and playfulness.

#### **5.1.1 Meaningfulness in Design**

I believe that we do not only experience our everyday things, our everyday things are also lived. My everyday life is filled with experiences. The things I have are experienced. Thus, as my life is lived and experienced, so are my things. I live with my things and I experience them. They are a part of my life and my experiences. But for having those things in my life, they must be meaningful to me in some way. As they are experienced, they become filled with meaningfulness to me, and thus also lived. The notion of lived things is time related, since things become lived over time. Hallnäs and Redstöm (2002) mean that we first invite things in our lives and then an act of acceptance fills them with meaningfulness. However, I primarily believe that meaningfulness in our everyday things is created when we experience them, rather than in the act of acceptance itself. Hence, our everyday things are not meaningful per se, but become so when we experience them. Illstedt Hjelm (2004) at her hand argues that meaning in an object is something that we

actively construct and that this meaning appears as we interact with the object. In this view meaning is something constructed. Meaningfulness is about motivation, since doing something requires motivation, which outermost is related to our actions. What is the difference between inviting and accepting an object which then is filled with meaningfulness and interacting with an object in which we construct the meaning? They are different ways of interpreting how we apprehend and relate to an artifact. The difference lies in, as I see it, that Ilstedt Hjelm (2004) emphasizes interaction where Hallnäs and Redström (2002) point out presence. The diverse point of departure leads to divided views, descriptions and explanations of an objects' place and role in our everyday life.

To connect this to the case study, the concept had to open up for meaningfulness. This was made by letting the participants decide themselves what they wanted to design. On the way to create an understanding of the vest and how it was to take place in their lives, they ventilated experiences; invented experiences, and real lived experiences. In relation to the above stated, in one sense the concept can not be considered as meaningful at this stage. It is not experienced in real life, only on a conceptual level. However, in developing a concept, we must make room for meaningfulness and experiences. Having that in mind and working towards enabling meaningfulness and experiences can act as a base at this stage in the design process. We must remember that this everyday thing is to be experienced, filled with meaningfulness and over time lived. In order to make that possible the concept must come from within those going to have the thing in their life. Interesting to note is that even though they had taken part in developing a concept with themselves as starting points, it was expressed that it was not obvious that they would use the vest if it existed in reality. A consideration on having it was connected to a row of "Yes, *if...*". This points out that there is something else than just to creating something according to users' needs that can be crucial in design. Here this something else is interpreted as being the meaningfulness of the object. As a complementary example from the interviews (not about textiles, but medical technology), E talked about her breathing machine. The breathing machine was important to her. It was standing in the middle of the bedroom beside her bed. She had it during the night due to her low lung capacity which was an effect of the scoliosis. The machine saved her life and she was alive thanks to it. She had had it for 14 years. She was given the ultimatum that if she did not use the breathing machine as she should, she would have to have another machine that would be constantly attached to her. It was hard, she told me as she demonstrated the machine to me, to get used to the machine since it was very loud. This made it difficult to sleep in the beginning before she got used to it. Nowadays she had a hard time to sleep without the sound from the machine. She did not want to be without the breathing machine, in the sense that it had a certain implication to her. She expressed that the machine had a place in her life and was grateful in having it. It was an everyday thing, which was meaningful to her. This example tells us how important the meaningfulness is that we feel for an everyday thing. Further it tells us how an everyday thing has become a lived thing over time, in the sense that it has become an experienced object. As a complementary example we have B who also had a similar machine since six months. He had not started to use it regularly at night yet, but was training on that. He had his machine outside his house, in a storage room in a bag. He did not like to use it, since the mask hurt and his dogs wanted

to sleep in his bed at night. It then became messy and crowded to use the breathing machine. This is an example on how it can be when a thing has not yet become meaningful or lived, nor accepted. These two examples both deal with acceptance, meaningfulness, experience, and the lived object, but from different starting points (it is however important to note what role the time aspect might play). They raise a question. In this context of chronic sickness in need for certain aid, things were chosen for us and not by ourselves. Then, can it not be so that an object must be meaningful to us before we can accept it in our life? According to what was found in this case study, I believe so. Then, this leaves us with certain implications in designing for these everyday things. Not only the implication that we need to engage the user in the designing and take advantage of her conceptions of her everyday life, but also that the base in designing in the field of medical technology needs to be shifted.

Meaningfulness is not only there for us if the object has certain design. Meaningfulness in this context is also dependent upon if we accept the life situation and the sickness. It is then reasonable to believe that this acceptance is a prerequisite and must be enabled. But can it also be the other way around – that a well-designed object can help in accepting the life situation? I believe, on the lines of Ilstedt Hjelm (2004), that an emotional significance is required for a thing to become meaningful. She argues that meaningfulness is important for well-being, and that an object that is meaningful has emotional maintenance, which makes it an object that we can live with longer. This is one strong reason for enabling meaningfulness in design.

### **5.1.2 Form and Function Revisited**

It is time to end apprehending the notion of form and function as an everlasting tug of war. Ilstedt Hjem (2004) means that the form/function issue is obsolete. Yes, that might be the case, depending on which field we are pointing at. In the field of medical technology, it is my belief that the form/function issue has not been given space yet, which makes this issue current. The engineering perspective in this field then has brought an function-orientation in design (see Aronson, 2004; Druzgalski, 1998; Lawrence, 2003). This view is seemingly unchallenged. In designing products and software, technology and functionality has been taking the leading part (Ilstedt Hjelm, 2004), which also makes the issue interesting. From this perspective designing with technology is facing a crossroad. As was seen in the workshop, form and function were both central in creating the concept as well as an understanding of the object that was under development. The view that Westerlund (2002) presents is not about form being function as from the point of view that they are interwoven, but as form being *one part* of function – eventually also a function. This view sends out a signal that function is superior and dominating over form. The question is whether this view is appropriate or not when designing everyday things. Or rather, the question is not what follows what, but rather if it is not more that they, form and function, go hand in hand. From my point of view form is function and function is form. They are two sides of the same thing and are inseparable. Form and function are interplaying. In the interplay something happens. Together they enable an experience of an object. How can we possible distinguish what is form and what is function of an object? Without the other an experience can not take place. The experienced object can not have a function without a form in the same way

that it can not have a form without a function. Form and function are integrated in expressions, I interpret Hallnäs and Redström (2002). The notion of expressions can act as a joiner.

### **5.1.3 Playfulness in a Serious Context**

Playfulness becomes of interest as we try to find ways into design for something serious, as a chronic sickness. Playfulness as an approach may sound inappropriate to some in this context. But playfulness is not equal to respectlessness. Rather, playfulness in a serious context *is* to pay respect to the matter. I mean that when we try to find complementary views, or to develop an area, it is reasonable to believe that we seek for and try out all possibilities to do that. It would then be disrespectful not to apply this in all areas, how serious or not they might be. Further, playfulness is not the same as profoundlessness. Rather, deep and well-founded thoughts are vital when dealing with something seemingly contradictory. Then, what can be included in the notion of playfulness? Playfulness can be to turn on the conceptions. It can be to use imagination. It can be to not care about limits that someone else has happened to decide being appropriate. If a traditional view implies approaching a serious matter in just as serious way as thought demanded, then playfulness can challenge this traditional view, just as form can challenge function as base in design for the medical technology field. This attitude on playfulness raises questions. What is playful and what is not? Who decides? Is the playful of today playful tomorrow? Is playful for me playful for you? No obvious or one-sided answers can be given. Nor can they be answered with a universal truth. But what we can say is that a playful attitude towards something that normally is not connected with playfulness means that it is no longer treated in isolation and as an exception, but on the same base as all other fields that we design for.

### **5.1.4 Formulating an Approach**

As stated in the introduction, the field of medical technology seems to be focused on technology and function. If we have a chronic sickness we sometimes need to have this kind of technology- and function-oriented objects in our everyday life. Let us put these things in relation to fashion, to use an illustrating example. When it comes to fashion people seem to be willing to wear all from high heels restricting the walk to small hand bags occupying one hand. People seem to be prepared to do this and accept that this is the case. Fashion can take many expressions where experiments with colours, shapes, patterns, material, styles, and form and function are non-ending or even expected. Here form can be in focus just as natural as function or a combination of both. If we apply this fashion attitude (acceptance of the experimental and high level of acceptance) on medical technology objects, what would these medical technology objects look like then? It is reasonable to believe that people's attitudes, apprehensions and relations to these objects would be different. I do not mean that for instance persons with stoma should accept and expose themselves to and endure stoma bags on the same ground as we do with high heels. What I mean is that there is a potential in fashion that can be interesting to look into and learn from. A more playful attitude perhaps would make it easier for people to accept and embrace IT in everyday objects. One point in this thesis is that medical technology products do not always fit in our homes (Lehoux, 2004), since medical technology products and our everyday things are created on different bases and from

different perspectives. When a medical technology object enters our home, this becomes obvious. If we have to wear them they come even closer to us, and we do not only have to see them, we also feel them. To see and feel can act as a reminder of the sickness. If we now have to feel and see them all the time, they should at least fit us and our life, just as everything else we have. Perhaps not everyone care, but it is anyhow an object that we have not chosen to live with, but was chosen for us. Through going via the user and her knowledge and expertise on living with the sickness and the object, when developing an object of this kind, we can develop it so it can fit her life. If we then approach it with more playfulness maybe this can be done.

Clearly, a shift is needed in the design within the field of medical technology. This shift incorporates, as I suggest here, a focus on meaningfulness, form and playfulness. We should approach medical technology products from the same starting point as being used in all other design of everyday things. There is no need in making this field an exception. Maybe this is even more important in this context. However, there is one aspect that we must specifically pay attention to. A chronic sickness is something one must live with, whether one wants it or not. A sickness is not self chosen, and so are not the things one must have that are “attached” to the sickness. Those things are not things that one should endure, or having to learn to live with or learn to endure. They should be open for meaningfulness, experiencing, and being lived on the same basis as all other everyday things that we surround us with. The difference that we have not chosen to have them ourselves makes design for these everyday things even more challenging. This is what makes meaningfulness, form and playfulness in the design for medical technology products so important. To achieve a more playful design, as the conception is understood in this context, we could start with the person and her life. Through this, we can enable a further understanding of critical and important issues to bring into the design of those everyday things.

With starting point in the above discussed an attempt to formulate an approach for designing in the field of medical technology can take form. Three main points can be made:

- Enabling for meaningfulness is vital.
- Form can be used as base in designing. Function certainly has to be present, but not as a selfevident or unchallenged point of departure.
- Using a playful attitude can expand the scope in designing within this field.

## ***5.2 Method Discussion***

The designer has many tools for understanding the user and tools for conducting a workshop. It seems like the users have no tools for understanding the designer. This creates an unbalance. If a study is to be collaborative or participatory the participants must fully understand what they are taking part in. They must be given tools for creating their own understanding. It is not sufficient that only the designer can do that. If they are to contribute they must know what to contribute with, how, and for what reason. This facilitates the process from the participant’s perspective, I would say. I experienced that

the participants not fully understood what they were participating in when they came to the workshop, even though I thought that had explained. However, they were curious and wanted to understand. It was stated during the closing of the workshop that they had accomplished an understanding. Anyhow, this is an implication that must be considered when using this kind of methodological framework.

Try it Yourself was useful in the sense that I as a designer could grasp some of the issues that there might be using a brace. It was important to get this rough insight before interviewing the participants. I was not able to receive an understanding of brace wearing in a long term perspective, due to my short wearing time. My experiences were also limited to what I did in my everyday life during the wearing time. This method had it weakness in that that it was I myself that decided what issues to bring out and not in the dairy. This meant that I had to be aware of this “power” and write down everything without making any judgements. The outcome of the method as it was used here was also dependant on how I am as a person and if I have worn or seen a brace before, bringing pre-judgements about brace wearing. As the method was used here, it was for me to get an understanding, a purpose that was fulfilled. To bring out more general issues persons with authentic experience from brace wearing could be used. That was done in the interviews. The participants who wore a brace in their youth emphasised stiffness and not being able to bend over in describing experiences with the brace. The participant who wore a brace today pointed out that is was warm during summertime and problems with keeping it fresh. It suited the study very well to use the reflexive approach in the qualitative interviews. Since I wanted to gain insight in life experiences it required the participant to do most of the talking and thus also form of the content. This rich data that I was able to collect could not have been gathered in another manor. Thus, it does not exclude that it could have been combined for instance with participant observations in their everyday life and/or with cultural probes (Gaver et al., 1999). Regarding the workshop, it could have been divided into two sessions. It became quite intense and the concept was not given the opportunity to mature over time. It would have been an advantage if I had brought possible materials more than textiles to the workshop to make the computational technology more tangible. However, it was not possible to know what materials to bring in advance. It could have been possible if there were more than one workshop. I believe that the outcome of a workshop like this one depends on those who are participating (and of course on how the workshop is designed). In this case the participants wanted to participate and had contacted me by free will. This was an advantage. The fact that they had met before also turned out to be important, in the sense that we had created a relationship. The largest problem was to find the participants, since I had to rely on the channels I used. Since I could not be more active than I already was, I had to wait and see who contacted me. This meant that I could not speed up the process in finding the participants. It turned out to take several weeks.

### **5.3 Further Work**

Further work could be to take an experimental approach in the actual crafting of the vest, and thus investigate and elaborate with possible techniques and materials. It would then be appropriate to take new methodological turns. Another way of going could be to view this thesis as an initiating example on how to approach the field of medical technology in

design. It would then be necessary to expand the scope and deepen the conceptions in order to work towards finding a new base for designing within this field. This could be done through looking into other design areas and include persons with other chronic sicknesses to find out what other implications of everyday life there might be. A third way could be to go deeper into one aspect brought out in this thesis, for instance meaningfulness or playfulness, and investigate further how to enable that when designing for chronic sickness and everyday life.

#### **5.4 Conclusions**

I have in this thesis suggested a reconsideration on designing within the field of medical technology. An approach was formed, where three crucial points have been made. Enabling for meaningfulness is vital. Form can be used as base in designing. Function certainly has to be present, but not as a selfevident or unchallenged point of departure. Playfulness can expand the scope in designing within this field. This approach implies that we should approach medical technology products from the same starting point as being used in all other design of everyday things.

## References

Abowd, Gregory & Mynatt, Elizabeth (2000). Charting Past, Present, and Future Research in Ubiquitous Computing. *ACM Transactions on Computer-Human Interaction*. Vol. 7, No. 1, March 2000, p 29-58.

Andersson, Nicklas (2002). Helping the Helpers. In *Proceedings of NordiCHI 2002*. p 223-226.

Aronson, B Robert (2004). Manufacturing for the HUMAN BODY. *Manufacturing Engineering*. May 2004; 132, 5, p 65-77.

Bers, Marina U & Gonzales-Heydrich, Joseph & Ray DeMaso, David (2001). Identity Constructing Environments: Supporting a Virtual Therapeutic Community of Pediatric Patients Undergoing Dialysis. In *Proceeding of CHI 2001*. Volume No 3, Issue No 1, p 380-387.

Bers, Marina U & Ackermann, Edith & Cassell, Justine & Donegan, Beth & Gonzalez-Heydrich, Joseph & Ray DeMaso, David & Strobeck, Carol & Lualdi, Sarah & Bromley, Dennis & Karlin, Judith (1998). Interactive Storytelling Environments: Coping with Cardiac Illness at Boston's Children's Hospital. In *Proceedings of CHI 1998*. p 603-610.

Bouma, Herman & Czaja, Sara & Umemuro, Hiroyuki & Rogers, Wendy A & Schultz, Richard & Kurniawan, Sri Hastuti (2004). Technology: A Means for Enhancing the Independence and Connectivity of Older People. In *Proceedings of CHI 2004*, ACM Press. p 1580-1581.

Brandt, Eva & Grunnet, Camilla (2000). Evoking the Future: Drama and Propos in User-Centered Design. *Proceedings of PD Conference 2000*.

Buchenau, Marion & Suri, Jane Fulton (2000). Experience Prototyping. *Proceedings of DIS 2000: Designing Interactive Systems*, ACM Press, p 424-433.

Bödker, Susanne & Grönbaek, Kaj & Kyng, Morten (1993). Cooperative Design: Techniques and Experiences From the Scandinavian Scene. In *Participatory Design. Principles and Practices*. Schuler, Douglas & Namioka, Aki (eds). Hillsdale New Jersey, Lawrence Erlbaum Associates.

Coillard, Christine & Leroux, Michel A. & Zabjek, Karl F. & Rivard Hilaire, Charles (2000). SpineCor – a non-rigid brace for the treatment of idiopathic scoliosis: post-treatment results. *Eur Spine J* (2003) 12, p 141–148.

Danielsson, Aina J. & Wiklund, Ingela & Pehrsson, Kerstin & Nachemson, Alf L. (2001). Health-related quality of life in patients with adolescent idiopathic scoliosis: a matched

follow-up at least 20 years after treatment with brace or surgery. *Eur Spine J* (2001) 10, p 278–288.

Druzgalski, Christopher (1998). Bioengineering and Biotechnology - Systems on a Chip/Integrated Design. *IEEE*. p 292-296.

Ehn, Pelle & Kyng, Morten (1981). Cardboard Computers: Mocking-it-up or Hands-on the Future. In *Design at Work: Cooperative Design of Computer Systems*. Greenbaum, J and Kyng, M (eds). London, Lawrence Erlbaum Assoc.

Ehn, Pelle (1992). Scandinavian design: On participation and skills. In *Usability: Turning technologies into tools*. P. S. Adler and T. A. Winograd (eds). New York: Oxford University Press.

Ehn, Billy & Klein, Barbro (1999). *Från erfarenhet till text. Om kulturvetenskaplig reflexivitet*. Stockholm, Carlssons.

Gaver, Bill & Dunne, Anthony & Pacenti, Elena (1999). Cultural Probes. *Interactions*. January + February 1999. p 21-29.

Hallnäs, Lars & Redström, Johan (2002). From Use to Presence: On the Expressions and Aesthetics of Everyday Computational Things. *ACM Transactions on Computer-Human Interaction*. Vol. 9, June 2002, p 106-124.

Hammersley, Martyn & Atkinson, Paul (1995). *Ethnography: Principles in Practice*. London, Routledge.

Hourde, Stephanie & Hill, Charles (1997). What do Prototypes Prototype? In *Handbook of Human Computer Interaction*. Amsterdam, Elsevier Science BV.

IDEO (2003). *Method Cards: 51 Ways to Inspire Design*. San Fransisco, W Strout Architectural Books.

Ilstedt Hjelm, Sara (2004). *Making Sense – Design for well-being*. PhD Thesis. KTH.

Jacobs, Margot & Mazé, Ramia (2004). Design-by-doing: Workshops for Designing Interaction. In *PDC-04 Proceedings of Participatory Design Conference Vol 2*. p 114-117.

Jones, John Chris (1992). *Design Methods*. New York, John Wiley & Sons.

Kyng, Morten (1994). Scandinavian Design: Users in Product Development. *Human Factors in Computing Systems*, 1994, April 24-28, p 3-9.

Lawrence, Ghislaine (2003). Design solutions for medical technology: Charles Drew's profound hypothermia apparatus for cardiac surgery. *Perfusion*. May2003, Vol. 18 Issue 3, p 155-162.

Lehoux, Pascale (2004). Patients' perspectives on high-tech home care: a qualitative inquiry into the user-friendliness of four technologies. *BMC Health Services Research*. 2004, 4:28. <http://www.biomedcentral.com/1472-6963/4/28>

Liskey-Fitzwater, N & Moore, CL & Gurel, LM (1993). Clothing importance and self-perception of female adolescents with and without scoliosis. *Clothing and Textiles Research Journal*. Volume 11, Spring 1993, p 17-22.

Mackay, Wendy E (2004). The Interactive Thread: Exploring Methods for Multi-disciplinary Design. In *DIS 2004*. p 103-112.

Marculescu, Diana & Marculescu, Radu & Khosla, Pradeep K (2002). Challenges and Opportunities in Electronic Textiles Modeling and Optimization. *DAC 2002*. p 175-180.

Martin, Thomas & Jones, Mark & Edmison, Joshua & Sheikh, Tanwir & Nakad, Zahi (2004). Modeling and Simulating Electronic Textile Applications. *LCTES '04*. p 10-19.

Mazé, Ramia & Redström, Johan (2004). Form and the Computational Object. IN *CADE Web Proceedings of Computers in Art and Design Education Conference*. Eriksen, Agger M, and Malmborg, L, and Nielsel, J (eds).

Mecheels, S (2001). High-Tech-Textiles. *Allgemeiner Vliesstoff-Report*. 2001 Issue 1, p 2.

Muller, Michael & Wildman, Daniel M & White, Ellen A (1993). Taxonomy Of PD Practices: A Brief Practitioner's Guide. *Communications of the ACM*, June 1993/Vol 36, No 4, p 25-28.

Muller, Michael (2002). Participatory Design: The Third Space in HCI. In *The Human – Computer Interaction Handbook*. Jacko, J A and Sears, A (eds). New Jersey, Lawrence Erlbaum Inc.

Mynatt, Elizabeth D & Essa, Ifran & Rogers, Wendy (2000). Increasing the Opportunity for Aging in Place. In *Proceedings of CUU '00*, AVM Press. p 65-71.

Oulasvirta, Kurvinen och Kankainen (2003). Understanding contexts by being there: case studies in bodystorming. *Personal and Ubiquitous Computing*, Volume 7 , Issue 2 (July 2003), p 125 – 134.

Olafsson, Yngvi & Saraste, Helena & Ahlgren, Rose-Marie (1999). Does bracing affect self-image?: A prospective study on 54 patients with adolescent idiopathic scoliosis. *Eur Spine J* (1999), 8: 402-405.

Park, Sungmee & Jajaraman, Sundaresan (2001). Textiles and Computing: Background and Opportunities for Convergence. *CASES'01*. p 186-187.

Post, ER & Orth, M & Russo, PR & Gershenfeld, N (2000). E-broidery: Design and Fabrication of textile-based computing. *IBM Systems Journal*. Vol 39. Nos 3&4, p 840-860.

Pratab, MR & Shinde, S (2002). Smart Textiles. *Man-Made Textiles in India*. June 2002, Vol. 45 Issue 6, p 208-212.

Preece, J & Rogers, Y & Sharp, H (2002). *Interaction Design: Beyond Human – Computer Interaction*. New York, John Wiley & Sons, Inc.

Redström, Johan (2001). *Designing Everyday Computational Things*. Ph. D. Thesis. Gothenburg Studies in Informatics No. 20, Göteborg University.

Reichel, Dagmar & Schanz, Juliane (2003). Developmental psychological aspects of scoliosis treatment. *Pediatric Rehabilitation*, Vol. 6, No. 3–4, p 221–225.

Scoloveno, MA & Yarcheski, A & Mahon, NE (1990). Scoliosis treatment effects on selected variables among adolescents. *Wester Journal of Nursing Research*. Oct; 12(5), p 601-15.

Sapountzi-Krepia, DS & Valavanis, J & Panteleakis, GP & Zangana, DT & Vlachogiannis, PC & Sapkas, GS (2001). Perceptions of body image, happiness and satisfaction in adolescents wearing a Boston brace for scoliosis treatment. *Journal of Advanced Nursing*. Sep; 35(5): 683-690.

Tractinsky, N & Katz, AS & Ikar, D (2000). What is Beautiful is Usable. *Interacting with Computers*. 13, p 127-145.

Ugwonali, Obinwanne F & Lomas, Guillem & Choe, Julie C & Hyman, Joshua E & Lee, Francis Y & Vitale, Michael G & Roye, David P Jr. (2004). Effect of bracing on the quality of life of adolescents with idiopathic scoliosis. *The Spine Journal* (4), p 254-260.

Veldhuizen, AG & Cheung, J & Bulthuis, GJ & Nijenbanning, G (2002). A new orthotic device in the non-operative treatment of idiopathic scoliosis. *Medical Engineering & Physics*. 24 (2002), p 209–218.

Weiss (Tamar), Patrice L & Whiteley, Carolynn P & Treviranus, Jutta & Fels, Deborah I (2001). PEBBLES: A Personal Technology for Meeting Educational, Social and Emotional Needs of Hospitalised Children. *Personal and Ubiquitous Computing*. Springer-Verlag London Ltd, (2001) 5:157–168.

Westerlund, Bo (2002). Form is Function. In *Proceedings of DIS2002*. p 117-124.

## **Appendix A**

### **Question Areas for the Qualitative Interviews**

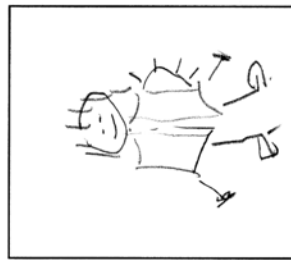
- Can you tell me about your scoliosis history? What does it look like?
- How is it to live with scoliosis? Tell me.
- Can you tell me about experiences you have made in your life that are connected to scoliosis?
- Has the fact that you have scoliosis shaped or influenced your life in some way? If yes, then how? Tell me.
- How was it to live with scoliosis as a youth and how is it now? What difficulties were there/are there and how did/do you handle them? Tell me.
- Have you used a brace? Tell me about that.
- Can you tell me about a day in your life? What can it look like? Tell me about that.
- What do you think of when I say IT? What do you think of when I say textiles? Tell me!

## Appendix B

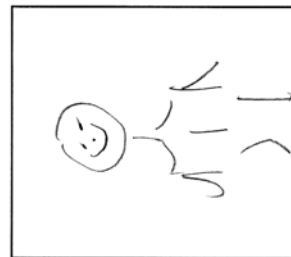
### The Storyboard made during the workshop



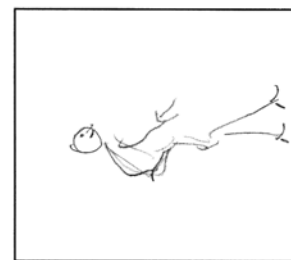
Här sitter jag  
 så skönt och  
 smalt, fint  
 på teatern  
 i min nybyggda  
 väst,



Plöpp så  
~~kommer~~  
 materialet och  
 så ut och  
 in när man  
 behövs fylla ut  
 jämn heter



Har min nya  
 väst i ett kvadrat  
 mit material  
 med deltagar-  
 sammening



Har jag jag  
 till teatern  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_