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Involving children and elderly in the development of new design concepts to become active together

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Involving Children and Elderly in Design Research as a Combined User Group to Inform Design

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Abstract. Designers need to have an empathic understanding of their intended users if they are to design products that fit. This holds especially strong for elderly and children as user groups, because they are very different from the designer. However, it might be harder to obtain this information from children and elderly. This paper describes a research project that explored new approaches to involve children and elderly as a combined user group in the context of user involvement in product development. The research took place in a design setting; the development of an intergenerational movement park. We describe the role these two user groups played in the design process in order to develop new products that help them to be physically and socially active together. The process is examined on two aspects: the combination of the two user groups and the influence of the users on the project. We will discuss the methods used, the outcomes and give recommendations.

Keywords: UCD, contextmapping, children, elderly, co-research

1 Introduction

Over the past decades, methods to involve users as informants in design have gained acceptance. But, how can we use them when designing for a combination of two different user groups? And even more challenging, vulnerable user groups like children and elderly? In this paper we describe methodological aspects of a project in which these challenges arose.

1.1 Incorporating the Users' Perspective

In participatory forms of User Centered Design, designers incorporate the users' perspective and needs as a basis for innovation. Throughout the process they cooperate with users to evaluate designs, but also to get inspired and informed in the fuzzy-front end of the design process. Contextual User Research is conducted early in the design process to support designers with creative understanding [1] and to find requirements for design. Techniques used in this field include on-site interviews as in

Contextual Inquiry [2], homework and diary exercises as in Cultural Probes [3], and generative techniques, as in the Contextmapping method [4].

1.2 Intergenerational Interaction

In society at large there is a tendency to recognise children and elderly as vulnerable user groups. An example of this is the special protection of children and elderly as participants in medical research [5]. Municipalities in the Netherlands are focusing on empowering its citizens and giving them control instead of nurturing them. However, most municipalities recognize that children and elderly are vulnerable groups and should receive increased attention for their special needs.

The municipality of Delft wants to explore intergenerational contact in the public space to see if it can be beneficial for both age-groups in terms of staying active and having social contact. Next to that, the municipality of Delft does not have enough space to give every segment of the population their own recreational area, so having a combined space for children and elderly could serve this practical goal as well. The creation of a shared recreational experience for children and elderly forms the design context of the research presented hereafter.

1.3 Understanding Children and Elderly

Incorporating the users perspective is of importance with every user group, however, since children and elderly are user groups whose lifes differ greatly from the average designer, it is more difficult to create empathy and understanding for these user groups than for user groups that the designer has more in common with. When working with elderly and children it might be hard to obtain contextual information, since they often depend on their guardians, who may form an obstacle to reach them directly. Experience from design projects of colleages in our studiolab, showed that it is difficult for children to provide in-depth knowledge about their context, and for elderly, motivation to join contextual design research is sometimes low. Therefore, special attention for the incorporation of their needs in the design process is needed.

Inclusive Design and Design for Aging have special attention for the needs of elderly [6]. Not only by listening to elderly but also by mimicking and experiencing their abilities they try to develop empathy and get insight in their needs [7,8]. In the Child Computer Interaction (CCI) community, design methods have been developed to support more active roles for children in the design process to incorporate their needs [9, 10, 11].

The goal of this research is to explore the enablers and barriers of involving children and elderly in the design process when designing for the combination of these user groups.

2 Methods

In this paper we focus on two specific moment in the design process of an intergenerational movement park. First, on the contextual design research at the start of a design project that aims to find requirements for design. And second, on

evaluative research to test if concepts developed from user insights are actually fitting the wishes and needs of its users.

To find out children's and elderly's experiences with being active together and their wishes, fears and expectations for the new intergenerational movement park it is impossible to just ask them. This kind of knowledge is not on top of one's mind and deeper levels of knowledge need to be accessed. Therefore we use contextmapping [4], which is a method that acknowledges users as valuable experts within the design process and gives them tools to enter and express deep levels of knowledge about their needs and wishes.

In contextmapping, users receive playful exercises to observe a part of their own experience (sensitizing). This is used as preparation for a group session, in which they create expressive artefacts, and have a discussion about their considerations. It builds on users' abilities to observe, reflect, and discuss. Contextmapping has originally been developed for use with adults. Since then, it has been applied with a wide variety of user groups, including children [12, 13] and elderly [14].

To evaluate the design concepts we use co-research. This is similar to contextmapping in that it involves users observing, reflecting, and discussing parts of their lives. But whereas in contextmapping these activities are led/facilitated by a design researcher (who may or may not be a designer), in co-research some users themselves take on the tasks of design researcher in interacting with other participant users, facilitated in this by the design researcher. Figure 1 depicts the situation, with two adults (designer and design researcher) and two participants from the user group (co-researcher and participant).

Earlier research [15] shows several benefits to using co-research. Co-researchers can use their network to get access to peers or key-persons. Conversations between peers generate different content than conversations between a participant and a researcher. And by listening to others and hearing different people talk about the same subject, the co-researchers reflect on their own experiences and develop a more grounded opinion of their own.
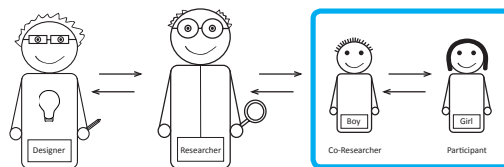
Fig.1. Communication steps in co-research [15]

3   Case Study

3.1 Context of the Case Study

In 2010 the municipality of Delft and the TU Delft decided to join the ProFit Project in order to turn an old playground into an intergenerational movement park, in which children and elderly can be active together. The ProFit project is financed by an Interreg IVB fund and combines technology, sports and health through the

development of FieldLabs (www.fieldlabs.eu). A FieldLab for sport and play innovation is a research and development location in a real-life setting. Companies can install new product prototypes in the FieldLab where the end-users can use and test them as part of regular sports and play activity. Knowledge institutes use the FieldLab to collect data on the end-user interaction with the products. The FieldLab is supposed to become dynamic in the sense that new innovative products and services are being used and tested regularly.

The new FieldLab in Delft is located in-between an elderly home and family houses and has two primary schools located nearby. Since there is not enough space to facilitate outdoor recreation for children and elderly separately and because of the expected benefits from them interacting with each other, the municipality decided to focus the new FieldLab on these two user groups together and turn it into an intergenerational movement park. The park is targeted at children between 8-12 and elderly from around their seventies.

In order to explore the wishes and needs of children and elderly for the intergenerational park and to investigate their current interaction and possible future interactions, several contextmapping studies were performed as part of this research (further described in section 3.3).

To ensure that the Fieldlab is seeded with working prototypes, a competition is organised to motivate commercial parties to develop a prototype. User needs from the contextmapping studies are presented to the competing companies. Five companies that design playground equipment or want to expand their market in this direction, developed a design concept for social interaction and physical exercise in the intergenerational movement park (see section 3.4).

Users evaluated these concepts together with peers by conducting co-research. Insights from the co-research with children and elderly were presented to a jury to support them in picking a winning concept (see section 3.5). The winning company was assisted in producing a prototype and placing it in the intergenerational park, to be tested by citizens (see section 3.6).

This process enabled us to explore the involvement of children and elderly in the design process when designing for the combination of these user groups. Both the user needs research in the form of contextmapping sessions and the evaluative co-research study will be described as part of the case study below.

3.2 Procedure of the Case Study

This case study followed the procedure of figure 2. Each step will be described in the upcoming sections. The user needs research and the evaluative study of the design concepts were the moments in which the user groups were most involved. Key words from the initial user needs research were used in the evaluative sessions to check if the original values are still recognisable in the submitted concepts. The reactions of the user groups were summarised in an overview that helped a jury to decide on the winning concept.
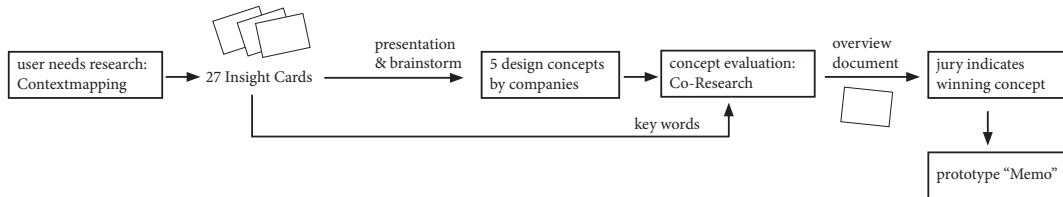
Fig. 2. Steps of the case study

3.3 User Needs Research

Several contexmapping studies are conducted to find out the wishes and needs of children and elderly, with the focus on them being active together. The research questions leading these studies are:
- What role does "movement" play in the daily life of children and elderly?
- How do they interact with each other?
- What are their wishes and needs for being socially and physically active in the intergenerational movement park?
Three different kinds of studies are conducted: contextmapping studies with elderly, with children and with a mixed group of children and elderly together to find out how to deal with the combination of user groups. These studies are described below.

Contextmapping with elderly. The contextmapping process with elderly included sensitizing assignments and group sessions. It started with recruting elderly via a gymnastics group, a flower arranging group and calling door to door. After asking forty elderly, nine of them were found willing to participate. They received a sensitizing package (Fig. 3) which included a workbook with several assignments about moving and being active.
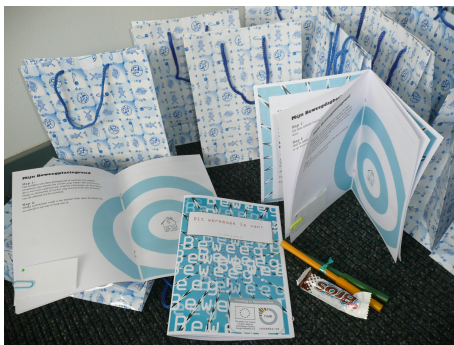
Fig. 3. Sensitizing packages for elderly   **Fig. 4.** Session with elderly

By filling in the small assignments over the course of a week, the participants documented and reflected on their own lives in relation to the topic to raise their awareness and prepare them for the group session.

During two group sessions (Fig. 4), the elderly explained and discussed the answers they gave in the sensitizing booklet. Due to scheduling issues, one session involved six participants and one was held with three participants. Subsequently they did three creative assignments in which they made a collage about being active throughout the years, a map of a future movement garden and a game to play with children and elderly together. Their explanations and discussions were used for analysis (see the end of this section).

Contextmapping with Children. The contextmapping process with children also consisted of a sensitizing period followed by group sessions. The recruitment of the children was done at a primary school in Delft from which two classes participated. The groups of 25 children aged 7-8 and 28 children aged 10-11 were divided in smaller groups of 5-6 children. Since we were working with two different classes and different age groups the complexity of the materials and language was adapted to each group.

Fig. 5. Session with children

The procedure started with presenting the project in each class and distributing the sensitizing packages. The goal of this package was to let the children observe and reflect on their own behavior as preparation for the group sessions. This was done through a variety of assignments about how active they are, what they do during the day, different situations they encounter and their interaction with "old people". After giving the children one week to work on their sensitizing workbook they came together for a contextmapping group session (Fig. 5).

The sessions started with an icebreaker; a short exercise to loosen up the children and prepare them for the session ahead. The icebreaker took the form of a playful exercise, which showed the children that all input is valued and every answer is interesting. After the icebreaker the sensitizing booklets were discussed and background information about certain answers was obtained. Subsequently, the children did two creative assignments; filling in an association scheme and the design of a new game to play with elderly, and discussed them within the group. Their conversations were the main source for the analysis (see the end of this section).

Contextmapping with a Mixed Group. During the sessions with children it became clear that some of them had a hard time assessing the skills and interests of elderly

people. Next to the separate sessions, a combined session was conducted with children and their grandparents together. In this session the children got immediate feedback from their grandparents on their thoughts and ideas. Also the other way around was valuable, the elderly got immediate feedback if they over- or underestimated the children.

Recruiting children and elderly separately turned out to be very hard. Children didn't want to interact with unfamiliar elderly and elderly were not motivated to go to a school and interact with children they don't know. It was much easier when the children were asked if some of them could bring their grandparents for a session. This way, 5 pairs of children and their grandparents participated.

During this session the children and grandparents had to think of activities they already do together and what they would like to do together. They jointly designed a movement garden and thought of an intergenerational game. Not these designs, but the discussions and explanations they provoked were used for analysis and translated into wishes and needs.

Analysis and Results of the Contextmapping Sessions. All the sessions were recorded and transcribed. Statement cards [16] were made from interesting quotes and subsequently clustered. The results from this analysis are presented in the form of Insight Cards; a set of 27 cards with an explanation of the most important themes. The cards were designed to inform and inspire designers when thinking of ideas for the intergenerational movement park and as input to further develop their concepts. The cards were the main source of user insights for the ProFit innovation competition.

Insight Cards. To make the cards useful and inspirational to designers each insight card consists of certain aspects (figure 6): an inspiring title, explanation of the theme and why it is important, raw data in the form of quotes or drawings, a visualization of the theme and a box of text that gives designers a starting point to work with that particular insight. This creates a mix of different levels of information to make the cards empathic, inspirational and engaging, as suggested by Sleeswijk Visser [17].

The cards are devided in four themes; the relation between children and their grandparents, the meaning of "movement" and "being active" and in case of the elderly how that changes over time, and motivations and obstacles to move. An example is displayed in Fig. 6, to give an indication of the gathered insights. The full set can be found on *fieldlabs.eu/insightcards*.
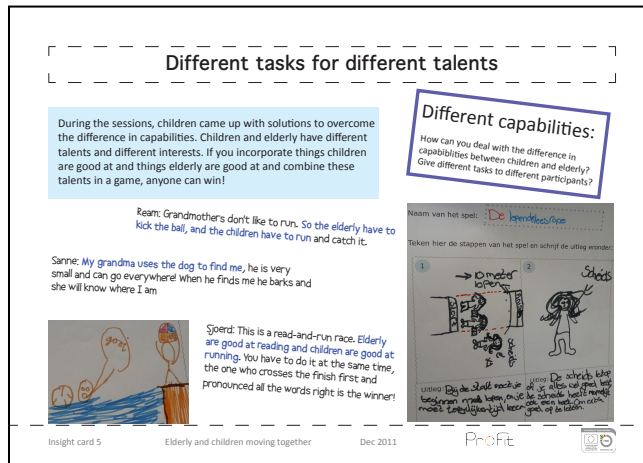
Fig. 6. Example of an insight card

3.4 Competition Entries

The insight cards were, together with a design brief, presented to several companies during "Mix and Match sessions". These sessions were part of the Profit project in order to enthuse and prepare companies for the innovation competition. In the sessions the cards were used by companies and design students together as input for a brainstorm about products that stimulate children and elderly to be physically and socially active together. Five companies ultimately submitted a concept for the innovation competition.

3.5 Evaluation of the Entries by Users

The submitted design concepts were evaluated with co-researchers from both user groups. Two children and two elderly each used research booklets to interview two peers and thus gather more opinions and ground their own opinion. Subsequently, they reported about their findings in a feedback-session. These opinions were input for the jury to help them decide the winning concept, which was to be placed in the intergenerational movement park.

Procedure of the Evaluation. During the preparation, the co-researchers (Fig. 1) were instructed on how to perform the interviews and received voice recorders and two research booklets. The purpose of the booklet was to guide the co-researcher in the course of the interviews by explaining the aim of the research, giving interviewing tips and providing structured questions. In the course of the interviews the co-researcher wrote down the answers to the questions in the booklets. The booklet started with questions about the relation between the co-researcher and his/her participant, followed by the explanation of the five concepts and interview

questions. The booklet ended with an assignment requiring a comparison of the concept designs, such as "Put the concepts in order of preference", "Which one fits you best and why?", or "Which one do you think others like best and why?"

Each co-researcher conducted interviews with two peers. After one to two weeks the co-researchers came together with the researcher for a feedback session in which they reported about the interviews and ranked the concepts in order of attractiveness. To check whether the original user needs were recognised in the concepts, keywords were abstracted from the earlier contextmapping sessions. The co-researchers pasted the key words on the concepts of their choice and explained their reasoning why they think the words belong to the affiliated concepts. The reactions of the co-researchers and their participants to the concepts were gathered and combined into an overview (figure 7), which included the most important findings of the evaluative research, a preference scheme of the different participants and positive and negative quotes about each concept. The overview included pictures of the co-researchers and the used materials to make it empathic. These overviews were presented to the jury to feed their discussion.

Fig. 7. Overview of the concept evaluation by children and elderly

3.6 Winning Concept

After a discussion about various aspects of the submitted design concepts, including user needs, reputation of the companies and producability, the jury decided that the company Yalp (www.yalp.nl) designed the winning concept. Subsequently, Yalp developed a working prototype and placed it in the intergenerational movement park. Various observational studies of users interacting with the product, as well as technical issues, lead to a new and improved prototype called "Memo" (Fig. 8). It consists of 7 interactive poles on a base of 8 meters in diameter. With the central pole a choice can be made between 4 games, for example interactive tag or a math game. This prototype is almost market ready and is placed in the park for final testing in the beginning of 2014. Some observations of the natural occuring play have taken place but they are not described in this paper. It turns out that children use and like the product, but elderly do not really join the game.

Fig. 8. Revealing the Memo prototype

4 Results and Discussion

The goal of this research was to explore the involvement of children and elderly in the design process when designing for the combination of these user groups. This research concentrated on two specific moments in which children and elderly can have a significant role in the design process: the contextual user research at the beginning of the design process and the evaluation of design concepts. The design solutions itself were not designed together with the user group because this was part of a design competition and the responsibility of the companies.

All the different elements of the case study are examined on two aspects: the combination of the two user groups and the influence of the users on the project. In the light of those two aspects we will discuss the methods used, the outcomes and recommendations for future research.

4.1 Combining User Groups – Reflections on Methods Used

Contextmapping. The focus of the contextmapping research was on the interaction between the two different user groups and their context. One of the questions in the sensitizing booklet of the elderly was "What do you think children think of you?". This turned out to be a controversial question. Some elderly reacted angrily and said that they don't know what children think of them and that we should ask children if we wanted to know. One elderly woman even phoned the researcher to express her contempt for this question. The same thing happened with the children's version of the sensitizing booklet. Some of them didn't answer the question "What do you think elderly think of you?" either. For both groups it was hard to empathise with the other user group.

Comparing the separate contextmapping sessions to the session with children and elderly together it was observed that during the combined session the two user groups could assess each other's skills and interests better. By working together on creative assignments they can give immediate feedback on each others ideas and the researcher gets to see their "live" interaction. This led to session results that combined needs from children and elderly better.

The bond between grandparents and their grandchildren was very important in the combined session. Their interaction and relationship was disclosed to the researchers through their joint participation in the research. The relationship between grandparents and their grandchildren was also important for the recruitment of participants. Originally the plan was to recruit elderly and children that were unfamiliar to each other for a combined session in the school of the children. This turned out to be impossible, both the elderly and children were unwilling to participate. This changed when the children were asked to bring their grandparents. These elderly were willing to participate without even knowing what they were going to do. They joined because their grandchildren asked them. This shows that children can function as important key persons in the recruitment of elderly. However, it should be considered that this way of recruiting leads to a specific group of elderly that have a special relationship with the children.

Evaluative Co-research. In the evaluation of the concepts it became apparent that children and elderly have very different opinions. They assessed the concepts from their own perspective, not taking the multi-generational aspect into account.
A difference between children and elderly in the feedback session of the evaluative co-research was that children were mainly expressing their own opinion, enriched by those of their participants, and the elderly reported the opinions of their participants and themselves as one. The elderly were constantly looking for consensus; they debated about the different concepts until they had the same opinion. On the recordings of the co-research interviews the different opinions can be distinguished. Where the children had an outspoken opinion, the elderly gave a more nuanced image of their opinion, making it harder to see what they really want.

4.2 Combining User Groups – Reflections on Outcomes

Combining the needs of the two user groups, children and elderly, was harder than expected. One of the first insights about this occurred during this combined session when children and their grandparents drew a map of the movement garden. Some of the intergenerational duos just drew a big line in the middle of the map and divided it in a children's part and an adult part. This was one of the indicators that they were unfamiliar with the very idea of a shared space for social interaction and physical exercise.

Even though children and elderly have different contexts, needs and wishes they could bridge them occasionally during the sessions. One example is the idea of a "run-and-read-race" (see insight card Fig. 6). This idea shows that the children are aware of the different roles and skills of children and elderly and how they can be combined. The children said: children are good at running and elderly are good at reading, so why not combine these skills into a race where you have to read a book aloud and run at the same time. The first one who finishes and read all the words correctly wins. This is not a usable idea as such, but the way of thinking is inspirational. What are elderly good at and what are children good at and how can we combine this in a competition? Another example shared by children during the contextmapping session was playing hide and seek with grandmother and her dog. When the children are hidden, grandma instructs her little dog to go and search for

them, when he finds the children he barks and grandma will know where to find them. This idea represents the opportunity to divide roles relating to the different capacities and interests of each participant.

During the combined session the children were more interested in new technology and new games, where the elderly were nostalgic about the games they used to play when they were young. It seemed that they related play to very different experiences and had no combined interests. But during one of the assignments, the two generations found out that some of the games the elderly played when they were young were very similar to games children play nowadays. Sometimes only the name had changed, or new technology is used for the same games, like playing cards on the computer. After finding out, the children had renewed interest in their grandparents and asked for tips and tricks. This is also an interesting starting point for a new design and is presented as such on the insight cards.

4.3 Combining User Groups – Recommendations

When combining two very different user groups and researching their interaction it is important to see them together. By having them together in a combined session, they can give immediate feedback on each others ideas and the researcher gets to see their "live" interaction.

In this project co-research was used for evaluative purposes. But, for the Contextmapping research it would have been advisable as well to prepare the participants through a co-research assignment, in which children interview their grandparents and visa versa. Letting them experience, observe and report on an actual interaction might increase their empathy for each other.

During the contextmapping sessions, the elderly often talked about others to express their own values. This was undesirable during contextmapping, because it should be about their own experiences. However, co-research gives more opportunities to talk about others, share their context and relate these findings to themselves, resulting in in-depth knowledge from within the user group. More experiences about co-research for user needs research are reported in [15]. In this paper a follow-up research is described in which children interviewed peers and grandparents as co-researchers in the fuzzy front end of the design process to get insight in their context.

4.4 User Influence – Reflections on Methods Used

Children and elderly had an active role in this case study. However, how noticeable was their influence on the design process? During two phases of the design process their participation was strong; during the initial user needs research and the evaluation of the design concepts. In between and after these moments there was an abstract and indirect respresentation of the users in the form of insight cards. Because this case study was conducted in the context of a design competition, it differs from a "normal" design process. For example the choice of the concepts was done by a jury. During the decision making process of the jury, other factors, like company reputation and producability, were deemed more important by the jury than the opinion of children and elderly.

4.5 User Influence – Reflections on Outcomes

Initial observations of the "Memo" prototype show that the final design is not used together by users from the different generations. It might be that the original focus of combining the needs of children and elderly was too hard. However, during early brainstorms there were ideas that incorporated the directions from the user needs cards. In the end, the designers of the final prototype did not share the goals of the researchers and it turned out to be difficult to communicate and implement the user insights.

4.6 User Influence – Recommendations

This brings us back to the original focus of this research: exploring the user influence on two specific moments in the design process, the fuzzy front end and the concept evaluation phase. Perhaps if users were more involved throughout the whole process and were more in sight of the designers, the insights would have had a longer life and more impact on the final design. Also the criteria of the innovation competition could be maintained more strictly and the winning company might have benefitted from an additional user insight workshop to keep the user insights alive during further development of the winning concept.

Another discussion point is if the goal of combining the user groups and giving them a shared space to be physically and socially active together is the right societal solution. From the experiences gained during this project, the researchers have concluded that children and elderly themselves do not consider joint play and exercise as a natural option and they needed help to think about ways to cooperate.

4.7 Vulnerable User Groups

This paper opened with the statement that user influence is important in order to capture and incorporate wishes and needs of the user group in the design process, regardless of the user group. However, children and elderly are special user groups that are harder to reach and need extra attention. The municipality of Delft originally wanted to combine these two vulnerable user groups and let them use a new intergenerational movement park together.

It turned out that the elderly were indeed hard to reach. When conducting the case study we experienced difficulties in recruiting them. A solution was to involve the children in the recruitment of elderly. Children, on the other hand, were easily recruited via a school and were easily motivated: they loved skipping class to join the contextmapping sessions. So, children turned out less hard to reach but it was harder to get them to deeper levels of knowledge than with elderly. The anwers were often shallow and they needed materials, guidance and time to dig deeper; more than the elderly did.

At the start of the paper, it was argued that children and elderly are often very different from the designer who designs products targeted at them. Therefore it is important to gather information, inspiration and empathy when working with these user groups. In this case, elderly and children are also very different from each other.

Bringing them together gave insight in these differences and what the effects are of these differences on their ideas on shared activities. And it increased their interest and empathy for each other.

5 Conclusions

This paper explored the involvement of children and elderly in the design process when designing for the combination of these user groups. It concentrated on two specific moments in which children and elderly had a significant role in the design process: the contextual user research at the beginning of the design process and the evaluation of design concepts.

Combining user needs of these two very different user groups turned out to be problematic. A vital step in the initial user needs research was the combined session, in which the children and elderly came together. Their interaction and immediate response to each other in the session gave valuable insights about how to combine their needs. In the evaluation of design concepts the two user groups evaluated the concepts from their own perspective, not seeing the combined qualities.

The final prototype does not fully fit the original design brief: facilitating children and elderly to be socially and physically active together. Children use and like the product, but elderly do not join the game. When insights are given on how to design for a combined user group it is important to keep them alive throughout the product development.

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