# Miause

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**PHYSICAL AND SOCIAL REHABILITATION**
**DBP003- PROJECT 2 DESIGN**

# MIAUSE

September 2017 – January 2018

*“A playful tool to encourage the bonding between parents and their visually impaired child.”*

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## ABSTRACT

This project is about improving the bond between parents and their visually impaired child within the age range of 6 months to 3 years old using playful objects. Children with a visual impairment develop themselves in a different way, due to their lack of sight. That is why they express themselves different from others. Parents have difficulties interpreting their child's behavior because of this. This misinterpretation can cause frustration and anxiety for both the child as the parent(s). Therefore, it is important to stimulate the bond between parent and child, to create a better understatement of each other.

A playful object, MIAUSE, was designed to stimulate the bond between parents and their visually impaired child between the ages of 6 months and 3 years. This design consists of three objects: a cat, house, and booklet. Each object has lots of possibilities for several bonding techniques like auditory, tactile, visual mirroring and joint-attention, which have been proven to stimulate the parental bond. Other techniques used to improve bonding or increasing interest are close contact, in-out practice and fantasy stimulation.

The cat and house stimulate exploration, mirroring and joint attention by using of multi-sensory stimuli like sound, light, texture, bright colors, and color contrast. Furthermore, they contain visual similarities to motivate mirroring. The booklet is meant to guide the parents of the child; it contains a story to create a narrative for both to play in and to connect the cat and house, along with some suggestions for executing bonding behavior.

This report contains further information about the stakeholders involved in this project, the research that has been done, our design process, and our end result.



## ABSTRACT (DUTCH)

Dit project gaat over het versterken van de band tussen ouders en hun kind met een visuele beperking. Door hun beperking in zicht, uiten deze kinderen zich op een andere manier in tegenstelling tot kinderen met volledig zicht. Dit zorgt ervoor dat ouders moeite hebben met het interpreteren van het gedrag van hun kind(eren). Deze miscommunicatie kan leiden tot stress en angst bij zowel ouder als kind en daarom is het belangrijk de band tussen deze op een andere manier te versterken. Vijf studentes van de Technische Universiteit Eindhoven hebben in samenwerking met Bartiméus en Paula Sterkenburg, een (ontwikkelings-) psychologe, een speelobject ontwikkelt om de band tussen ouders en kinderen van 6 maanden tot en met 3 jaar met een visuele beperking te versterken. Dit speelobject maakt gebruik van spiegelen (het gedrag van de ander imiteren), joint attention (gezamenlijke aandacht voor hetzelfde) en andere interessante factors om de speelontwikkeling te stimuleren. Het eindproduct bestaat uit drie objecten, een kat, een huisje en een boekje. Zowel de kat en het huisje stimuleren exploratie, spiegelen en joint attention, door gebruik te maken van geluid, felle kleuren, licht, contrast, textuur en overeenkomstigheden die het spiegelen uitlokken. Het boekje dient als houvast voor de ouders of verzorgers van het kind, met daarin een verhaal wat de twee objecten verbind en suggesties om te spiegelen. Het verslag bevat verdere uitleg over de verschillende partijen die betrokken waren bij dit project, het onderzoek waarmee we onze ontwerpkeuzes zullen toelichten, ons ontwerpproces en het eindresultaat.

# INTRODUCTION

## DESIGN CHALLENGE

All children need to have a secure bond with their parents or caregivers in order to develop themselves on a social-emotional level (especially between the age of 6 months and 3 years). Parents or caregivers can create a safe bond with children when they are able to correctly mirror or verbalize their emotions. Children with a visual (and mental) impairment express their emotions in a different way. This may lead to difficulties for the parents or caregivers with interpreting their child's behavior correctly (Sterkenburg, n.d., p. 1). ''If children's disabilities affect communication, pose problems in how to interpret their needs and behavior, and increase parental stress (thereby reducing emotional availability), then we might expect less responsive caregiving''. This lack of interpreting needs and behavior also leads to a distressed child (Howe, 2005, p. 99). Therefore, we can conclude that parents or caregivers of children with a visual impairment may profit from a playful tool that stimulates bonding. In collaboration with Bartiméus, we designed with the following challenge in mind: How can we create/ design playful objects that stimulate bonding between parents/caregivers and visually impaired children between 6 months and 3 years old?

## STIMULATION OF BONDING

When two persons bond with each other, they contribute to a closer connection with one another. Bonding consists of behavioral sets that will help create an emotional attachment (Bruce & Perry, n.d., p. 1). When talking to a psychologist and some other experts at Bartiméus, mirroring was mentioned to be a very effective tool to stimulate bonding between parents and children. Mirroring is the action in which a person tries to imitate the actions of someone else. When the child is (partially) blind mirroring can happen when being in close contact with each other. It is important that the child can feel the movement or is able to imitate the sound. Also, the use of big and bright materials can clarify the action of mirroring. In short, stimulating mirroring behavior can be facilitated by being in close contact (body and face), making sounds and talking, making use of what the child sees and using bright and big materials.
Joint attention will also stimulate bonding between parents and children. Joint attention is the shared focus with others, through mutual gaze and responsiveness. Vision is an important aspect in order to engage in joint attention, but via touch and hearing joint attention might also occur (Bigelow, 2003). Other things that were recommended by the experts at Bartiméus in order to stimulate bonding were: auditive games, visual stimulation and playing in close contact.

## STAKEHOLDERS

Bartiméus is an organization that aims to contribute to a good life for visual impaired or blind people. So that they can live the life that suits them. They provide care and knowledge within several areas. According to diagnosing, treatment & rehabilitation, education, living and working (Bartiméus, n.d.). This organization provided us with a lot of knowledge and contacts, like the outpatient counselors and videos that we could use to retrieve information and feedback from. The outpatient counselors can introduce our design during their therapy sessions, working together with the parents. As they have daily experience dealing with this target group, their feedback was very important to us. Staying in close contact with this organization was therefore a very important factor in our design process.

Our main stakeholder and contact with Bartiméus was Paula Sterkenburg. A healthcare psychologist at both Bartiméus and the VU Amsterdam. She has a degree in psychology and developmental psychology. She introduced the problem to us and provided us with a lot of feedback and knowledge along the way. Her passion about ''bringing design solutions for healthcare (…), especially for families with children presenting disabilities'' inspired us to design for this target group (Manojlovic S. , 2015, p. 7). As she will continue with the development and validation of our design, involving her in our project was important.

Parents and caregivers were involved in our project too, as they are the ones to actually use our product together with their children. In the videos and booklets, provided by Bartiméus, the interaction between parents or caregivers and children with a visual impairment could be observed. Parents and caregivers need to stimulate the development of the child by keeping in mind three stages: holding on, letting go and doing it yourself. Moving together in the same direction is said to be part of the first stage, whereas giving security from a distance belongs to the second stage and at least stimulating repetition belongs to the final stage (Bartiméus, 1997). Parents and caregivers need to keep in mind

that, due to their impairment, it is hard for visual impaired babies to mirror others. Therefore it is important to actively engage the baby in the imitation of others (Bakker & Roza, Zo ontdek ik het [This way I explore], 2010). Playful objects can be used to facilitate this active engagement (Manojlovic, Boer, & Sterkenburg, 2016).

A master student (Stefan Manojlovic) at our department worked on a similar project, about the ''shifting value of healthcare moving from an institutional towards a home environment'' (Manojlovic S. , 2015, p. 8). He designed a playful tool for children with Prader-Willi and Down syndrome, as these children also have difficulties communicating with their parents. He discovered that interactive play is an important tool to stimulate the parent-child bonding process (Manojlovic S. , 2015, p. 8).Our target group both differs as overlaps with the target group of Stefan Manojlovic, and therefore his previous research was valuable for us. His work and its limitations according to our design challenge will be explained further in the Related Work section of this report.

## CONTEXT

In order to design for this specific target group, we had to gain some knowledge about the impairment and living environment of these children. Through observing, interviewing and researching we got familiar with the context we designed for. Visual impairment occurs when the visual acuity is less than 30 percent, this can take several forms, like partly sighted, night-blind, and photophobic. Children with a visual impairment have a lack of awareness according to space (of a room or a page in a book). Lack of vision also causes difficulties with coordination and balance, therefore they have less variations in their movements. It is important to let them experience new movements in a safe environment (Bakker & Roza, Zo ontdek ik het [This way I explore], 2010). Unlike sighted children, children with a visual impairment are only focused on the things they are playing with and not on the environment or people around them (Bakker, Roza, & Stokla-Wulfse, Zo zie ik het! [This is how I see!], 2008). A child with a visual impairment also plays in a different way than sighted children. When playing, a playing-development pattern can be recognized (Bartiméus, 1997):

- Exploring
- Combining (in-out game, putting two things together)
- Imitating
- Fantasy (creating a story around the play object)

It is important that children with a visual impairment are encouraged to move, mirror behavior and make use of other senses than sight. Visual impaired children profit from toys that make use of bright, clear colors, little details, sound, touch and in some cases light.

The remainder of this report is structured according to the different design phases; Ideation, Conceptualization, Realization and Validation. The iterative process will be explained per phase, referring to the design challenge, methods, research and feedback. But before the explanation of the phases, an overview of the Related Work together with its limitations and similarities is presented. At last, a discussion and conclusion are held to finalize the report. Additional information and the reflections of the group members can be found in the appendices.

## RELATED WORK

Parents should be a safe haven when responding and mirroring to the emotions of the child (Sterkenburg, n.d.). Being sensitive in the way that parents are able to interpret the signals of the children in a right manner. Being responsive means that the parents respond on the right moment and in a way that matches the signal of the child. For parents of children who are visual, and in the case of Manojlovic's research also mentally impaired, it can be hard to read their emotions. As already mentioned in the introduction predecessor master student Stefan Manojlovic also worked together with Paula at Bartiméus. He targeted the difficulties of families with children with special needs, particularly with Prader-Willie and Down syndrome (Manojlovic S. , Supporting parent-child bonding for family-centered healthcare, 2015). He found that to improve the bonding between parent and child is to interact with each other, which will also alleviate stress. The thesis amplified that motor and cognitive skills are important to develop through play, which also applies to our research. Another important finding is that the choice of the environment you are going to play in is important to the eagerness of the child to want to play with the toys.

The play guide for visual impaired children gave us lots of tips according to what works and does not for children with a visual impairment.

The play guide states:

> When choosing toys look out for:
>
> 1. Good color and tone contrast
> 2. Lettering that is bold and clear
> 3. Good reflection of light or fluorescent elements
> 4. Toys which encourage children to use their eyes to follow an object
> 5. Toys which encourage development of hand-eye co-ordination and/or fine motor control, using small finger movements
> 6. Interesting textures and tactile variety – some toys which look like they offer different textures, actually feel similar, like felt and velvet – test for yourself to see if the textures really feel different
> 7. A scented feature
> 8. Switches that are recognizable by touch such as on or off and click when operated
> 9. Toys which encourage awareness of cause and effect through touch – "when I press here, something happens"
> 10. Toys which make a sound or other cue to an action having occurred
> 11. Equipment and toys which encourage physical movement, running or jumping, or reaching and stretching for children with more complex needs (Newell & Atkinson, 2016, p. 5).

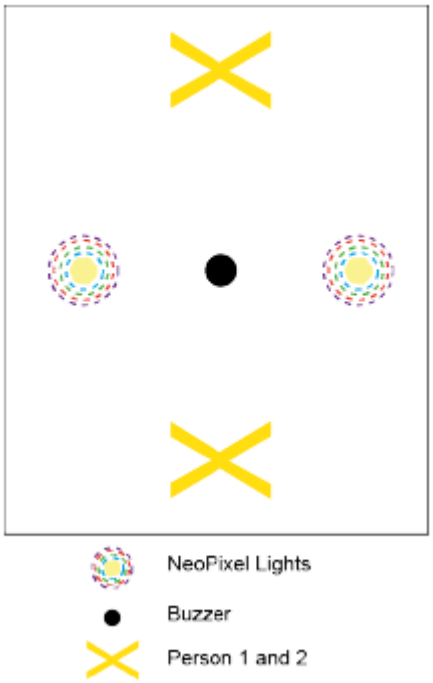



*Figure 1*

Stefan's final prototype is stated below:

> The first prototype for playful interactive mirroring consisted of a textile carpet platform that combined floor based exercises. It relied on positive and multimodal stimuli and was inspired by mirroring exercises. The carpet had sensors and actuators built in its soft surface. On the platform, one parent is designed to sit oppositely from the child. Between them and the integrated carpet are a buzzer and two rings of light, one on the left side and one on the right side (see figure

> 2.1). Very roughly, the platform worked as follows. First, a buzzer played a high pitch melody to direct the parent and child's attention to the carpet. After a two second pause, the rings of the NeoPixel lights lighted up. The idea was for the child and the parent to reach for the spot of light on the carpet. The light and sound were deliberately separated to not overload the child's processing of the local environment, and to not confuse the child (Manojlovic, Boer, & Sterkenburg, 2016).

Stefan tested his final prototype with a user, a child named Sarah. "Sarah was born prematurely. (…) For the first 6 weeks Sara was in an incubator, after 2 weeks, the hospital told them that Sarah was born with Down syndrome and other disabilities – she had vision and hearing problems" (Manojlovic, 2015, p. 41).

This was Sarah's reaction towards the prototype:

> Sarah however did not mirror the movement of the parents, leading to different deductions: a) being in such a bright room the light was not visible to the child, b) the child after the sound, was not aroused by the pixel ring light effect, c) the child was not able to process and recognize the light effect at the lighted-up spot on the carpet. However, in order to verify these deductions, the process of observation should be longer and the involvement of professionals (experts) is needed (Manojlovic, 2015, p. 64).

Point nine of the list above mentioned: "Toys which encourage awareness of cause and effect through touch – "when I press here, something happens"" (Newell & Atkinson, 2016, p. 5). One could argue that the hearing first a sound and then a bright light have an intertwined meaning; however, the light has nothing to do with the sound. There is no logic cause-effect between the light and the sound. Further on in the report Stefan stated that Sarah did get what was expected of her, after repetition. For visual impaired children like Sarah it is not intuitive what was expected of her, this could be a reason why this prevents the child from mirroring at first.

# CONTENT

## IDEATION

### ITERATION 1

The first phase of the design process is ideation, in this phase a lot of ideas are generated and the most successful ones are combined to create a concept. It is important to make use of ideation techniques that match the type of ideas that need to be generated, in order to reach desired results. One of the techniques used for the first iteration is mindmapping. The goal of mindmapping is to get a clear overview of important information, and find subjects that people often relate with the initial subject. After doing extensive research on parent child interaction, the most important results are written down in a mindmap (see Figure 2). Things related to these results are written down as well. The bonding possibilities that result from this mindmap can be used as a guideline for future concepts.

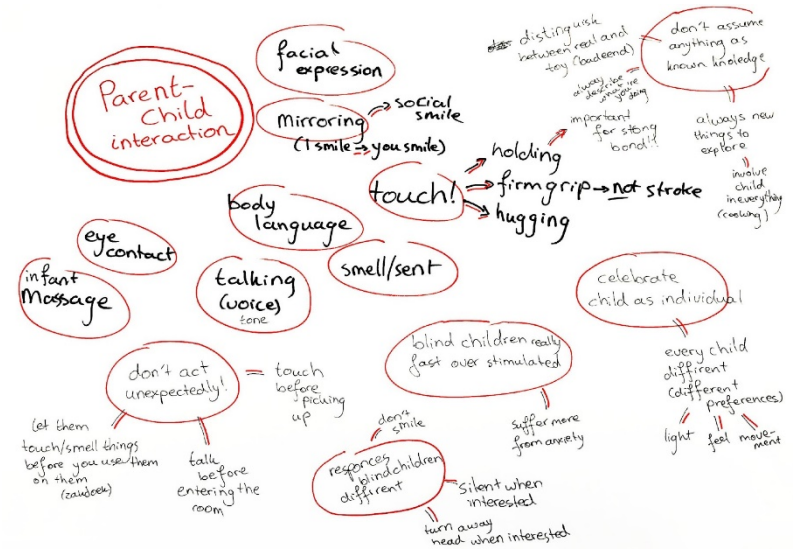



*Figure 2*

Another ideation technique used is brainstorming. During a brainstorming session, a lot of ideas are generated with no boundaries. Afterwards, these ideas are evaluated to find out whether or not they are feasible, and to what degree they stimulate bonding between parent and child. Finally, the best ideas are turned into concepts by describing them more in depth. An example of how brainstorming was executed in our ideation process can be seen in figure 3. Each person can write down an idea that they have, and all other people can directly respond to that by elaborating on the idea or producing a counter idea. This results in a lot of ideas, which is essentially the goal of a brainstorm session.

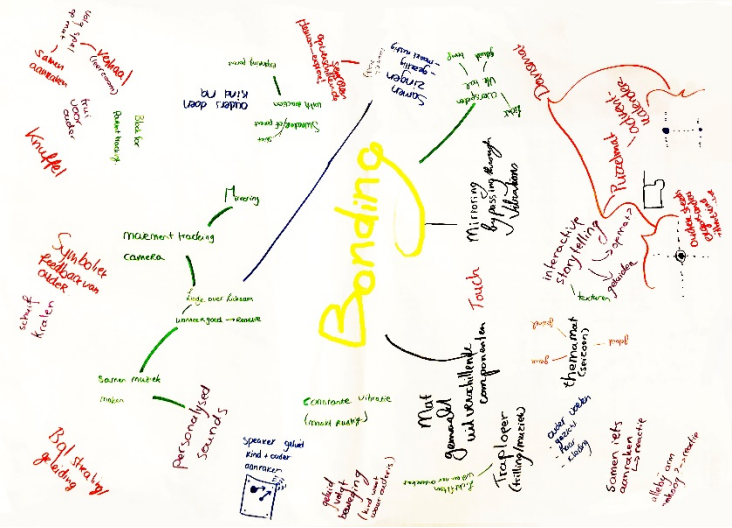



*Figure 3*

Brainstorming and mindmapping also often come intertwined. An example can be seen in figures 4 and 5. A lot of ideas are generated, but they are all linked to a particular sense. Discussing and combining the large amount of ideas resulted in six real, more detailed ideas. A theme-mat, a sweater, a puzzle-mat, a following game, a connector, and a bounce game. Each member of the team worked out one of these ideas. After discussion and feedback from Paula one idea seemed to be the best. This idea was a theme-mat which was further developed into a concept. To convey the important discoveries that were made during research towards the parents of a visually impaired child, the idea of a booklet came to mind. This booklet should contain a fun story to read to the child, along with some suggestions for the parents to improve their bond through the means of our theme-mat.

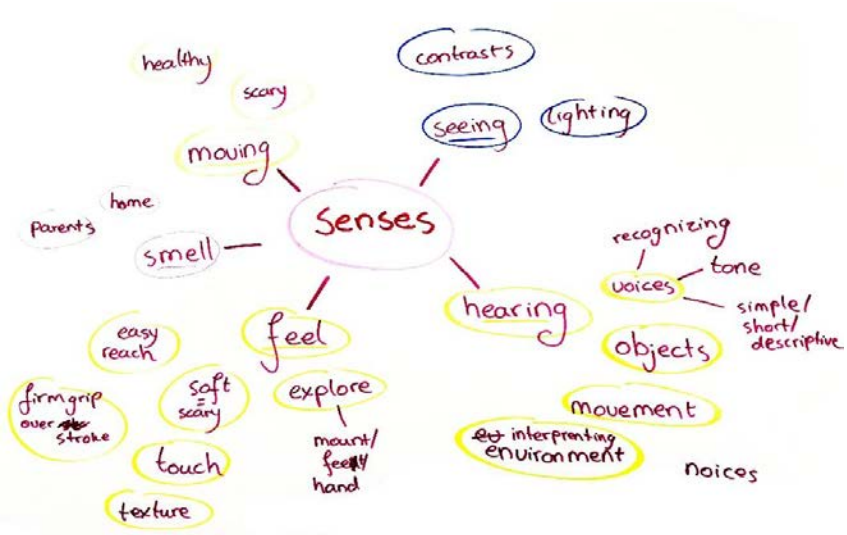



*Figure 4*


*Figure 5*

## ITERATION 2

Following the validation of iteration 1, the next ideation phase started. First of all, a common question asked during the validation phase, is why we chose to use farm-animals. This led us to reconsider this choice. Research pointed out that animals which are more relatable are more attractive to children. Multiple pets were chosen and for each of them the bonding possibilities, such as mirroring and joint attention, were written down. These little mindmaps showed that the cat had the most options, and also seemed to be one of the more popular pets, therefore the cat made it to our next concept.

Additionally, we went to the toddler-group at Bartiméus. We observed the interaction between the visually impaired toddlers and the toys, but also the interaction with each other and with the counselor. This observation inspired us to think beyond the mat, and we discussed the possibility of adding a house. The research done during the first ideation phase repeatedly brought forward that mirroring is a very important aspect of parent-child bonding. While brainstorming about the potentials of the house, a lot of mirroring possibilities came to mind. For example to make it a visually mirrored house, but there are also options to include light and sound that could be used as a means for mirroring, therefore we decided to include this house in our concept.

## ITERATION 3

The observation of the user-test led to a lot of results. It confirmed a lot of our thoughts on bonding, but it also made us aware of the limited capabilities of a visually impaired child. We made use of an ideation method that is similar to the SWOT-analysis to determine the strengths, weaknesses, opportunities and threats of our concept. Multiple criteria were determined that needed to be satisfied in order for our design to be successful. Based on these criteria, certain features of the design were placed in either the “keep” section of a table or they were dismissed. There was also an “add” section in the table, in order to bring new ideas to the stand. This table helped us to create a new and improved concept for the cat as well as the house.

## ITERATION 4

After analyzing the second user-test, with our renewed concept, a list of enhancements was made which can be found in appendix A. This ideation phase was the shortest of all, and most time was spent deciding what had to be changed in the concept, and what was valuable information for future improvements. Due to limited time and resources, financial- and knowledge-wise, we decided to only make the changes that directly influence the bonding, such as doubling the doors. Other changes, such as safely covering up all the electronics and sharp edges, were put on a list for future improvements.

## CONCEPTUALIZATION

In the four iterations done the conceptualization phase can be described as follows.

### ITERATION 1: THE FARM MAT

As described in the ideation phase we generated many ideas which we cropped into the 6 most potential ones regarding the design challenge. After we received feedback from Paula Sterkenburg **(Bartiméus)** on these 6 ideas we chose for the theme mat. This because of its multisensory potential and story-telling characteristic. We further conceptualized this theme mat into a farm mat based on the theme of a farm which fits the visually impaired children's real world experience (Mellor, 2016) while focusing on blind children.
It was chosen to facilitate parent-child bonding mainly by creating social interaction between parent and child by designing opportunities to make them play together. Furthermore, we incorporated bonding techniques as joint attention and mirroring in a multi-sensory way. The mat is chosen to be centered on the theme of a farm which allows parent and child to create a narrative while playing together which can enhance the use of the mentioned bonding techniques (Newell, 2016, p. 36). Children are namely very creative to convey meanings to others (Wohlwend, 2008, p. 128). Moreover, because we saw opportunities in designing for a learning curve we chose to focus in the concept of the farm mat on the entire range of our target group, blind children aged from 6 months till 3 years old. We also took into account the problem of limited movement occurring in the blind children's early age stages (Newell, 2016, p. 4).

The farm mat concept consists of mat on which parent and child can explore multiple farm animals as a horse, sheep, chicken and a cow by making use of the animals' tactile and auditory characteristics (see figure 6)**.**

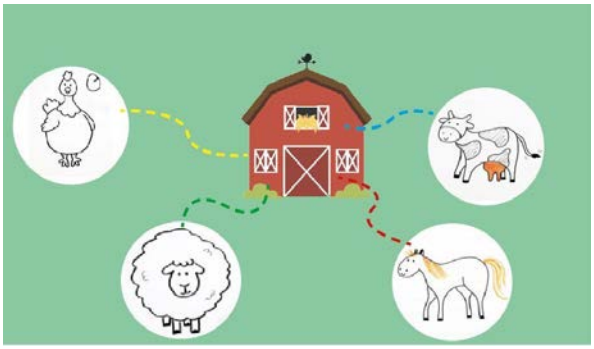


*Figure 6*

These multi-sensory characteristics, as fur and animal sounds, stimulate parent and child to focus on the same object which is joint attention. The multi-sensory stimulation also encourages mirroring, with a time difference, e.g. imitating animal sounds. We added a booklet to the concept as well, containing a story linking all farm animals to each other which can be read by the parent to create a narrative for both to play in. However, it also serves as a parental guide providing bonding suggestions, as "let your child feel the vibration of your cheeks while making a horse sound and do this the other way around" in cases of lack of creativity. These suggestions help to create a richer social interaction, namely a two-way interaction between the parent and the child instead of only from the parent towards the child.

### ITERATION 2: PETS MAT & HOUSE

After the second ideation we changed the farm mat concept to a pets mat concept together with a little 3D house and an adjusted booklet (see Appendix…).
From the mid-term feedback at our client Bartiméus we decided to focus on visually impaired children instead of solely blind children because more children at Bartiméus are visually impaired.

Resulting from the mid-term visit at Bartiméus we decided to use pets as theme for the playful mat because pets are closer to visually impaired children than farm animals in their daily context which may enhance the bonding process (Bakker K. &.-W., 2008). We decided to design the pets in a more abstract way leaving out details, based on the touch and feel books (Bakker K. &.-W., 2008). This by enlarging characteristics of the pets as ears, whiskers, tales and so on to ease multi-sensory exploration.

After interviewing Minette Roza, ambulant worker at Bartiméus, we added a little 3D house to the concept which would be placed in the center of the mat surrounded by a pets located in each corner of the mat. The in-out game played at the toddler group at Bartiméus was the inspiration and translated by us as an opportunity to incorporate bonding technique mirroring in a visual, auditory and tactile way which was hard to achieve with the pets only. The house concept consists of a small 3D house having 2 doors covered with similar pet fur; 2 doorbells that make the same pet sounds and 2 windows on opposite sides to stimulate mirroring on the same time as well as with a time difference. The doors could be opened to put objects in and take them out, the same for the windows, like the ears of one of the pets. Doorbells could be ringed on each side of the house to get a pet sound which could be imitated by parent and child, all to stimulate mirroring (see figure 7).

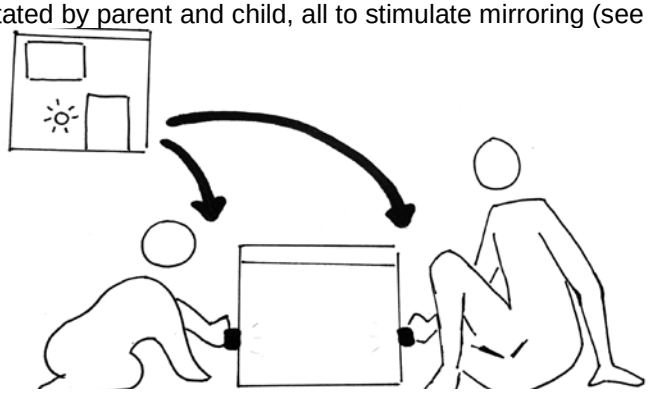


*Figure 7*

The house also has light to automatically indicate whether 2 objects, 1 by the child and 1 by the parent, have been put in the right way to provide feedback.

The booklet has been adjusted to the pets and also links them to the house to still create a narrative to let both play in. The suggestions were also adjusted to the pets and house and refined after reading the books and watching the videos provided by Bartiméus.
To take into account the change of our target group from blind children to visually impaired children we used color contrasts, primary colors, less details and light (Newell, 2016, p. 4). We used color contrasts by using primary colors and less details in the cat, house and booklet. Light was only used in the house.

### ITERATION 3: MIAUSE 1

One of the most important changes in concept after the third ideation phase is that we left out the base mat and the multiple pets and decided to go for one pet with the house and the booklet.
The cat was chosen as pet because this is one of the most common pets families have in their houses and is easy to relate to and create affection (Kaminski, 2002, pp. 1,330-333). Moreover, we obtained positive user feedback from the validation (first user test) with the realization of the second iteration which was the house, booklet and only a cat which contributes to the decision.
From the user test, with a 3-years-old visually impaired child, it seemed that the cat on itself was not as interesting to play with as the house which limits the child in using the bonding techniques joint attention and mirroring. It was namely seen that the visually impaired child was already done with the exploring phase, in his playing-development pattern (see chapter 1: Introduction). Therefore it was chosen to add auditory features to the tactile enlarged parts of the cat, especially the tale, to make it more interesting. Furthermore, to enhance the use of tactile and visual mirroring the tale of the cat can be loosened next to its ears to put inside the house.
In the third ideation phase we got the insight that visual mirroring, through using the house, needed more stimulation by using color contrasts. That is why we decided to let the opposite sides of the house be the same bright color. Lastly, the user test showed us that light was another interesting stimulus to be activated by the child itself, next to all auditory stimuli which were already provided. This made us add light to function as a mirroring tool on the house which can be put on by the parent and the child (see figure 8).

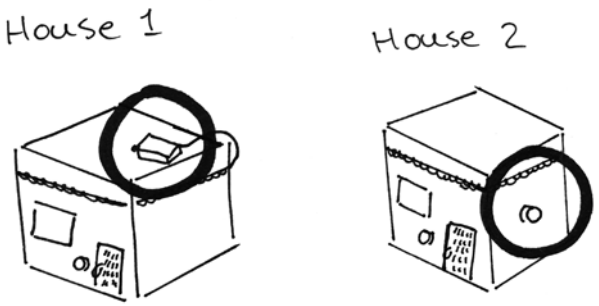



*Figure 8*

### ITERATION 4: MIAUSE 2

Minor but important changes compared to the third concept made sure that the concept would stimulate enough bonding and that child safety was improved.
Analyzing the second user test with a younger child, aged 15 months old, it could be concluded that the house together with loosened parts of the cat was used to play more with than the cat on its own. This led us to include not only joint attention in the cat concept but also visual, tactile and auditory mirroring by adding another tale to it. In this way the tales can be stroked simultaneously, shaken (bells ring) simultaneously and both can be loosened to put into the house which is again mirroring (see figure 9).

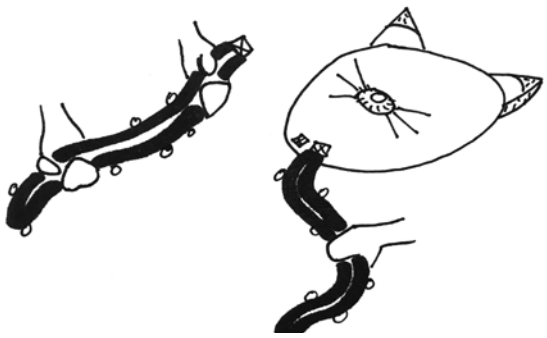


*Figure 9*

From the last user test we got the insight that it is not possible for every visually impaired child to notice whether the parent mimics the child's action on the opposite side of the house. Therefore we made sure mirroring is also possible when parent and child are on the same side of the house, by making 2 doors, 1 window and 2 bells on the opposite sides of the house. We also made sure the light put on by either the parent or the child was visible for both (see figure 10).

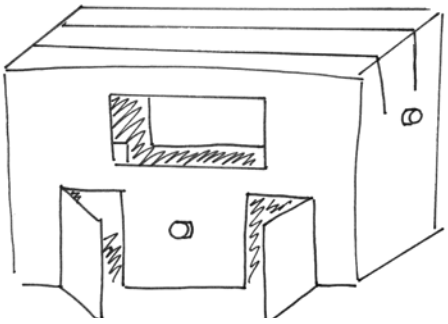


*Figure 10*

This improves the feedback parent and child can give each-other and thus the two-way social interaction.
Regarding the child safety, we decided to let the width of the house be bigger than its depth and height for stability.

The final concept can be concluded as a playful system consisting of one pet, a house and booklet. To make sure the design challenge has been achieved we included several techniques that can be practiced by parent and child playing together. These are: joint attention, close contact, auditory mirroring, tactile mirroring, visual mirroring, in-out practice and fantasy stimulation.
In the pet the techniques joint attention, close contact, mirroring (with time difference), mirroring (auditory with time difference, tactile and visual) and fantasy stimulation are incorporated. The enlarged parts of the cat have tactile and auditory characteristics that helps stimulating joint attention and mirroring. The enlarged parts are the ears, whiskers, nose and tales.
In the house we focused on incorporating auditory, tactile and visual mirroring but also added features for joint attention, in-out practice and fantasy stimulation. 2 doors with cat fur (on opposite sides and on the same sides), 2 windows (on opposite sides), 2 door bells (on opposite sides) and 2 light strips with related on-off button (on opposite sides) make sure the above mentioned techniques can be practiced.
The booklet links the house and the pet by providing a narrative for parent and child to play in. However, it also serves as a parental guide providing bonding suggestions in cases of lack of creativity.
To take the target group of visually impaired children into account we used color contrasts by using primary colors and less details in the cat, house and booklet. Light was only used in the house.

## REALIZATION

During the realization phase one will realize what is discussed during ideation and conceptualization phases. The use of material, techniques etc. will be discussed in this section.

### ITERATION 1

Our first concept was the idea of a theme mat, with the theme farm animals. Decided was to work out one farm animal pillow: the horse.

### PILLOW

Textile material was used to sew the pillow, the textile was scrap material from Wearables Lab, and so the choice of the material was based on convenience. The shape of a horse was cut out of faux-fur material, which was originally an unused dog mat. This material was picked since it represented the skin of a genuine horse. After that the shape of the horse was stitched onto the pillow, so the shape of the horse could be sewed onto the pillow. In the meantime one side of the pillow was still open so that the pillow could be stuffed with the stuffing material from another pillow. The pillow was stuffed since the softness and so the comfort of the pillow would invite the visual impaired child to explore the pillow. The mane was added to the horse, represented by hairs of a black wig. Hairs of a horse are a bit rigid just as the hairs of the wig; besides, the hairs add extra contrast with the pillow, which increase the visibility for children with a visual impairment. As finishing a sound module was added to the tail hair (made of same material as the main). The sound of a neighing horse was recorded while pressing a button on the sound module and one of us making the sound. When pulling the tail the sound module would have a closed circuit and play the recorded sound of the horse. See figure 11 for the end result.

*Figure 11*

BOOKLET

The booklet contains suggestions and a story to support the bonding between parent and child, while playing with the mat/pillow. The booklet was mainly focused on the parent, that is why the use of colors was not reckoned suitable for children with a visual impairment. The drawings in the booklet were made by hand with the use of paint, fine liner and pencil and scanned in as images. The background of the images and the text booklet was made with the use of the software Illustrator (Adobe © package). The text, images and background were put together with the use of the software InDesign (Adobe © package) (See appendix $C_1$).

## ITERATION 2

Between the first and second iteration we received lots of feedback from experts at Bartiméus, students and coaches at the midterm presentation and insights from Minette Roza (outpatient counselor) during the visit to the toddler group (see chapter: Ideation).

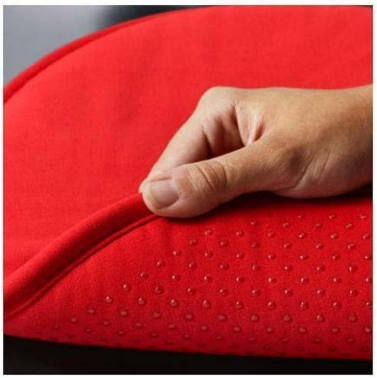


*Figure 12*

PET

Our first iteration included a pillow with a detailed faux-fur shaped horse. However, told was that a detailed shape like the horse on the pillow is of no use, since children who are visual impaired are not really able to see those details. That is why bright colors and contrast work a lot better (see chapter 2: Related work). Another suggestion was to consider pets instead of farm animals, since children are more familiar with pets. That is why the pillow was reconsidered. Instead of making the detailed horse on the pillow we decided to make the pillow a pet. The pet of our choice was a cat since it is a pet which is familiar in most households. The base of the cat is chair pillow CILLA from IKEA © (http://www.ikea.com/nl/nl/catalog/products/40330758/), since it has such vibrant red color and has a round shape, and has roughly the shape of a cat's head (see figure 12). The nose was made of 2 layers of black Styrofoam in a triangular shape which was hot-glued onto the middle of the pillow. Two layers were chosen so the whiskers could be hot-glued between those layers. The whiskers were made of bendable iron strips wrapped with bright yellow fur. A color which is in contrast with the red of the pillow. The flexibility of the whiskers adds an interesting and playful touch to them, and the softness of the fur makes them more inviting. A cat of course needs ears, so dark faux-fur textile was cut into two triangular shapes with the short side rounded. The two corners from the rounded short side were sewed together, and created so slightly cone shaped ears. To the two ears Velcro was added on the rounded short side and Velcro on the back of the top of the cat (the side with the anti-slip dots as you can see in figure 13). This made the ears detachable. Finally a tail was add to the cat since a tail would be nice to play with and could induce joint attention. The tail was made out of the same material as the ears to be consistent. A strip of the faux-fur was folded on the long edges and sewed together on the long edges and on one short edge. The same material to stuff the tail was used as for the pillow from the first iteration. After stuffing the tail the tail was sewed to the left bottom of the round red shape (see figure 13).

*Figure 13*

HOUSE

During the visit at the toddler group Minette Roza showed that the visual impaired children like to play an in-out game with a mouse and a house. That is what inspired us to make a small house in addition to the cat. The house was laser-cut out of MDF with a 3 mm thickness (See appendix $D_1$). Since the ears are detachable on every side an ear can be put into the house via the window and/or the door. The doors were supposed to be able to open and close with the use of a densely laser-cut pattern as hinges; however, this construction failed right before the user test so ductape was used as hinge. Next to the mirroring element of the door and the window on each side, an extra audio-element was added, namely a sound button on each side resembling a doorbell. The button was soldered to a sound module and when holding the button pressed one would hear a recorded cat sound instead of the neighing of the horse.

*Figure 14*

BOOKLET

There is a change of character, namely the horse is replaced with a cat. This time the cat is drawn with the use of the software Corel Painter Essentials and the drawing tablet called the Wacom Intuos Art. The booklet still contains suggestions and a story to support the bonding between parent and child while playing with the pillow. These suggestions changed due to reading the booklets and watching the videos from Bartiméus. After realizing it is fun for the child to look at the drawings when the parent is reading or just to look through the booklet for fun, the drawings are made in such way that they contain a minimal amount of details and lots of contrast, to increase the visibility for children with a visual impairment (see appendix $C_2$).

### ITERATION 3

Iteration 2 was tested during the user test with participant 1 (3 years old), his mother and his outpatient counselor Minette Roza at participant 1's home.

PET

The cat remained; however, features were added. Participant 1 enjoyed putting the tail of the cat into the house. Since the tail was fixed on the cat, Velcro was added on the short side of the tail and Velcro on the spot where the tail was first attached. To make the tail (and so the cat) more interesting extra bells were added to the cat and to so add extra audio effect. To enhance the look, feel and safety of the nose, the same fur was added as from the tails and ears on top of the nose while leaving a hole where the button was located (see figure 15).

*Figure 15*

HOUSE

During user test, participant 1 liked to lean on the roof of the house. The house resisted the weight, but instead of 3 mm MDF, 6 mm MDF was used for child-safety (appendix D2). Besides, the windows and the doors were too small, that is why the size of the house increased. Next to that Minette (outpatient counselor) thought of adding more contrast to the house to increase the amount of mirroring. Since the ductape was an emergency hinge real kid-proof hinges were added. To protect the children and the electronics from harm a laser-cut partition was added to every short side of the house. This partition could be put in between two thin laser-cut strokes of wood (see figure 16 for the end result).

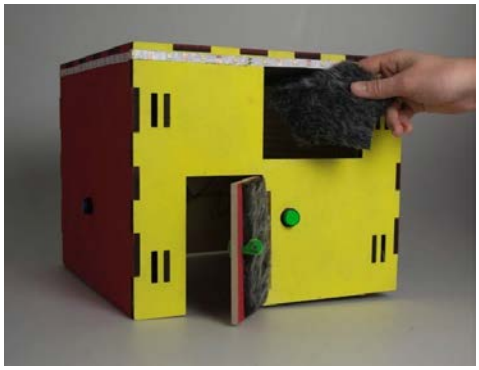


*Figure 16*

BOOKLET

The booklet remains the same as in iteration 2, however the image of the house was changed (see appendix $C_2$).

## ITERATION 4

The second user test with participant 2 (15 months), both parents and her outpatient counselor Minette Roza tested the third iteration at participant 2's home.

PET

While testing it was found that mirroring could also be done by using the tail. The parent and child could for example both put a tail in the house or as participant 2 liked to do wrap the tail around the back of their neck, like a boa. That is why an extra tail was added to the cat. The tail was made the same way as before. Minette gave us the advice to add something extra to make the cat more interesting, since the house was most of the time the most interesting. That is why, besides the bells, silver foil packaging material was added on the insides of both ears. This gives a cracking/crunching noise, inspired by the feel and touch books of participant 2. Next to the interesting sound the silver foil makes, it is also shiny and a bit reflective. This because participant 2 enjoys looking at herself into shiny things, which is a way of exploring (see figure 17).

*Figure 17*

HOUSE

Since participant 2 is only 15 months old it was hard for her to look over the house since the depth of the house was increased for iteration 3. That is why the depth got decreased. Since participant 2 had trouble looking over the house she could not really see what the person on the other side was doing, which could limit the child in mirroring. That is why on each side of the house two doors and two windows were laser cut on each side of the house (see appendix D3). This way parent and child can sit next to each other while mirroring. For older children who do can look over the house there is still the possibility to sit on opposite sides of the house (see figure 18). The previous house had lights around the house. The same problem was encountered, one person sits on one site and one on the other you cannot see whether the other person's light is turned on or off. That is why we put the light strip on top of the house, both from short side to short side (see figure 19).

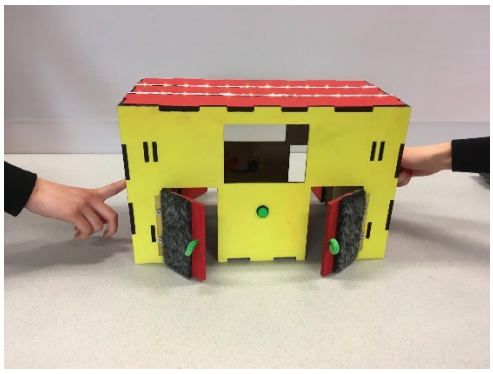


*Figure 18*

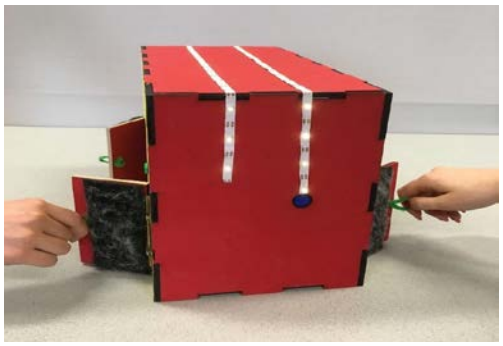


*Figure 19*

BOOKLET
The booklet remains the same as in iteration 3, except the image of the house has changed (see appendix $C_4$).

## VALIDATION

Every iteration in the design process ends with the validation phase. Here we put our concept to the test and check if it matches the user's needs. Afterwards we analyze the feedback and results we gathered using several methods.

### ITERATION 1

To test the first product iteration, the farm mat, we went to seek feedback from professionals. We contacted two different types of experts: design professionals and professionals in (caring for) visually impaired children.
Starting with design professionals, during the midterm demo day, where we presented our product to designers and coaches at the University of Technology in Eindhoven. The feedback we received regarding our presentation, prototype and concept from the teachers but also fellow design students was later clustered into the topics of; booklet, play mat, whole concept and recommended information sources (see Appendix E *Midterm feedback*).
Afterwards we visited Bartiméus institution Zeist and presented the same concept and prototype. Our audience existed of 3 outpatient counselors and Paula (see figure 20 and 21). These people work with young visually impaired children on a daily basis and, among other things, help parents to create a stronger bond with their child. With their user knowledge they provided us a lot of feedback, which was later clustered into the topics of; target group, bonding, aesthetics play mat and story book (see Appendix C *Booklets*).

All the information gathered by these expert meetings where thoroughly discussed in the team. While reflecting back on this first iteration we debated about which feedback we were going to bring into the next one.

Our main takeaways being:

- Think about storability
- Make it more suitable for the target groups age range [6 months – 3 years old]
- Do not stay 2D
- Implement lights, almost the entire target group still has some sight.
- Work with contrasts
- Avoid details
- Provoke mirroring, not action-reaction for better bonding
- Enlarge interesting parts of the animal
- Choose an animal that is close to the children. E.g. a pet.
- Keep the different levels in the story book to make the product more suitable for the target groups age range
- Keep the sounds


*Figure 20*

*Figure 21*

## ITERATION 2

### USER TEST 1

To test the second iteration, cat (version 1) and the first house, we were able to meet with a potential user at their home. This user was 3 years old and had 20% of his sight. Accompanying us that day was an outpatient counselor and the child's mother. We observed and videotaped (for which a consent form was signed (see Appendix F3 *Consent form*) the usual playing behavior of the child and its parent and later the child playing with the prototype together with the counselor and the parent. Afterwards there was an interview conducted with the outpatient counselor and the parent. A walkthrough of the user test was made. Here different methods were used: observation, interview and interference in play (see Appendix F1 *Approach*).

The video of the user test was spread among the project team members. The video was analyzed based on the following criteria; interest in sound, interest in light, interest in ears, interest in texture, amount of interaction between parent and child (touch, mirroring, feedback from child), fantasy stimulation, movement stimulation (in-out game, open-closing of doors, movement child through room) and possible additions for well working mirroring methods in the booklet. Observations and results of the analysis can be found in the appendix (see Appendix F2 *Analyzation)*.

From this new information and a discussion in the team we were able to decide which aspects of the concept we needed to keep and what aspects we should add to the concept (see figure 22).

| KEEP | | | | | | | | | | ADD |
|---|---|---|---|---|---|---|---|---|---|---|
| Bendable whiskers | Texture on ears | Removable ears | Sound in nose | **CAT** | Glue down the nose | Make tail more interesting | Add sound | Make tail removable | | |
| Mirror doors and windows | Texture on doors | 2 doorbells + sound | Laser cut | **HOUSE** | Thicker walls | Use hinges for doors | Make removable partitions between electronics and inside house with holes in them for sound | Give the walls different colors | More broad | Add easy light switch |
| Mirroring suggestions | "help the ears to get home" | "Sing a song" | Cat story | **BOOK** | Exercise to mirror with ears | Add interactions with light | Specify levels (write an introduction) | When child come with a suggestion go with that | "both look through the doors" | "Shall we ring the doorbell together?" |

*Figure 22*

## ITERATION 3

### USERTEST 2

To test the second concept, cat (version 2) and the red-yellow house (version 1), we were able to meet with a potential user at their home. This user was 15 months old and had 20% of her sight. Accompanying us that day was an outpatient counselor and the child's parents. We observed and videotaped (for which a consent form was signed (see Appendix G3 *Consent form*)) the usual playing behavior of the child and its parent and later on the child playing with the prototype together with the counselor and the parent. Afterwards there was an interview conducted with the outpatient counselor and the parents. The walk through of the user test is similar to the walk through of user test 1 and can be found in the appendix (see Appendix G1 *Approach*).
By observing the user test, afterwards analyzing the videos and by discussing the interview results there was a feedback list created (see Appendix G2 *Analyzation*).
The main points of improvement we gained from this user test being:

- It takes too long before the sound starts when pressing the doorbell
- The mirroring part is hard because she does not exactly know what is happening on the other side
    - Make two doors and two windows on each side of the house
    - Make the lightstrip go over the house.
- The cat is mostly interesting for children younger than 1 year old
- A second tail would stimulate mirroring
- Avoid sharp corners
- To make the ears more exciting add crackling material to the ear such as:
    - Foil which you put flowers in
    - Even better since it is reflective: rescue blanket from foil. Most children love reflection.
- Buttons are really appreciated and considered a lot of fun by the children

## ITERATION 4

### DEMO DAY

The prototype of the final iteration was presented at the Demo Day of the University of Technology Eindhoven. It is an exhibition like setting where at the end of their projects both bachelor and master

Industrial Design students present their work.
The prototype was presented together with a product poster, a design process poster, an information poster, information flyers and a slide show with product pictures. Posters and flyer can be found in the appendix (see Appendix H *Final Demo Day presentables).*
At this Demo Day we were visited by several project examiners, teachers at our department and outside visitors e.g. businesses. There was a lot of interest for our project and we had the pleasure to meet multiple interesting people and organizations (see figure 23 and 24).
After the closure of this project the same presentation will be given one more time at Bartiméus for our client.

*Figure 23*

*Figure 24*

# DISCUSSION

## IMPLICATIONS

Our design challenge is: how can we create/design playful objects that stimulate bonding between parents/caregivers and visually impaired children between 6 months and 3 years old?
In the result of the fourth iteration we tried to cover lots of useful research about bonding techniques, user context, stakeholders, the existing products; feedback from several experts and user tests, in order to fit the design challenge with our design. Our final design ended with some major highlights that could be used to design for bonding between visually impaired children and parents/caregivers which are influenced by all the above mentioned factors. Some of these factors caused some design implications.

The validation after the second and third realization was done with a rather small sample of participants, 2 in total and one after each of the two realizations. The families that are willing to user test are rare and therefore need to be protected against overcharging. The small sample may have led to a one-way view and less accurate results. We tried to cover the age range of our target group by making sure the two children had a big age difference, namely 15 months and 3 years old. But still the results from these tests were assumed to hold for the entire target group's age range which might not fit the needs of the remaining ages within this age range. We also assume that the cat is the most interesting for visually impaired children from 6 months till 1 year old. This because of the fact that they are still in the exploratory phase (see chapter 1: Introduction). However, this still needs to be tested.

Considering the eye conditions of the children, they were the same, about 20% sight. It would have been interesting to have had a difference in sight percentage between the children to be able to make more accurate validation on the colors, contrasts, materials and textiles used.

Another aspect worth mentioning is the potential pleasing behavior when interviewing the parents after both user tests. Questions were asked in a way to prevent this as much as possible but we cannot exclude it did not happen at all. As a result of, the fact that decisions made about book suggestions were based on the interview they could be biased.

## FUTURE WORK

### RESEARCH POSSIBILITIES

Parent-child bonding is a long-term process. In this design process we could not test on a long-term basis, because of a 16-weeks- project period and due to protection of participants by Bartiméus which is understandable. Therefore we focused on the occurrence of the intended bonding techniques as joint attention, mirroring and some observational side remarks as imaginary play. That is why it is interesting for designers to research whether these observations occur and develop positively or negatively over time.

In order to provide enough information to design for playful tools that stimulate the children's imagination as a tool to stimulate the bonding more research is needed about the link between the activation of bonding techniques and playing in a narrative. One user test clearly showed imagination helps in using bonding techniques and the other one did not recognizably show this link. Therefore this could be an interesting topic to take into further research.

With regard to provide enough information for designers to design playful objects that make use of multi-sensory stimulation, more research must be done to make choices about which materials and textiles to use to provoke interest and social interaction. In our design process no specific material study was done with visually impaired. For example, fur for the nose, ears, and tales of the cat and doors of the house was chosen by sighted people on convenience and contrast with surrounding materials.

### DESIGN POSSIBILITIES

There are two main aspects to be taken into account regarding future design possibilities.

Cultural aspects were not taken into account in our design process, such as the meaning of colors in different countries, variety in representations of a house or differing association with pets. Because

parent-child bonding with visually impaired children is not only a problem in the Netherlands, this might be a valuable opportunity for future designs in this area.

Child-safety was a factor we took into account when designing, especially in the last iteration, but was not worked out elaborately. We mainly focused on representative prototypes for the 2 user tests and for the Final Demo Day to test and show the intended parent-child experience. That is why we decided to make some recommendations for designers that want to follow up on our project to make sure they can properly design (see Appendix B *Recommendations*)

## CONCLUSION

The goal of this project was to design a product that would stimulate the bonding between a parent and their visually impaired child between the ages of 6 months and 3 years old. In a team of five TU/e Industrial Design students in cooperation with the association Bartiméus we took on the challenge and can now present to you, MIAUSE. MIAUSE is an interactive play object with a learning curve which makes it interesting for all children within this age range. MIAUSE offers parents or caretakers the opportunity to practice several research proven bonding techniques with their visually impaired child. Techniques that can be practiced with MIAUSE are: joint attention, close contact, auditive mirroring, tactile mirroring, visual mirroring, in-out practice, movement stimulation and fantasy stimulation.

MIAUSE exists out of three objects, a playhouse, a cat pillow and a story book filled with play suggestions to guide the parent in order to reach maximal bonding opportunities while playing with it together with their child. The house and the cat stimulate exploration, mirroring and joint attention by usage of sound, bright colors, contrasts, lights and texture. Especially the house is completely symmetrical to itself, which stimulates mirroring. The booklet connects the two play objects by using a story. Starting with the cat because of its simplicity, which makes it more suitable for the younger children. Later moving on to the house and it’s more challenging challenges, the house is designed for older children that are further in their development.

Does this mean our goal is met? We have no proof the play objects stimulate bonding, as this would take years to measure. We have proof that when playing with the play objects bonding techniques occur, like mirroring, which are proven to stimulate bonding. So yes, our goal is met. However there is always room for enhancement, you can read more about this in the discussion.

The development of MIAUSE is of significance since there is big lack of play objects and toys aimed at visually impaired children that stimulate the bonding. There are visually impaired children growing up all around the world, which makes our case a global issue. Our current prototype is developed at minimal cost and it already proved to be working for these bonding techniques. MIAUSE has the potential to bring aid to families all over the world.

## REFERENCES


Bakker, K. &.-W. (2008). *Zo zie ik het! Slechtziende peuter in een groep.* Doorn: Vereniging Bartiméus.

Bakker, K., & Roza, M. (2010). *Zo ontdek ik het [This way I explore]* (first ed.). Doorn: Bartiméus.

Bartiméus. (1997). See You the social development of children with low vision. Zeist, The Netherlands: Bartiméus.

Bartiméus. (n.d.). *De visie van Bartiméus [The vision of Bartiméus]*. Retrieved from Bartiméus: https://www.bartimeus.nl/over-bartim%C3%A9us/de-visie-van-bartim%C3%A9us

Bigelow, A. E. (2003). The development of joint attention in blind infants. USA. doi: 10.1017.S0954579403000142

Bruce, D., & Perry, M. D. (n.d.). *Bonding and Attachment in Maltreaded Children.* Retrieved from ChildTrauma: file:///C:/Users/Eigenaar/Documents/B2/Project%202/Articles%20Rauterberg/Bonding_13.pdf

Howe, D. (2005, October). Disabled children, parent-child interaction and attachment. Norwich, UK.

Kaminski, M. P. (2002). Play and Pets: The Physical and Emotional Impact of Child-Life and Pet Therapy on Hospitalized Children. *Children's health care*, 321-335.

Manojlovic, Boer, L., & Sterkenburg, P. (2016, June 3). Playful interactive mirroring to support bonding between parents and children with Down Syndrome.

Manojlovic, S. (2015). *Supporting parent-child bonding for family-centered healthcare.* Eindhoven: University of Southern Denmark.

Manojlovic, S., Boer, L., & Sterkenburg, P. (2016). *Playful interactive mirroring to support bonding between parents and children with Down Syndrome.* ResearchGate.

Mellor, C. (2016, April 14). *Helping a blind child to understand the senses at the farm*. Retrieved from Through Scarlet Eyes: http://www.throughscarlettseyes.com/helping-blind-child-understand-senses-farm/

Newell, K. &. (2016). Let's Play! Toys and play ideas for young children with vision impairment. *Let's Play! Toys and play ideas for young children with vision impairment*. UK: RNIB.

Sterkenburg, P. (n.d.). Spelenderwijs Spiegelen [Playful mirroring]. Vrije Universiteit Amsterdam.

Wohlwend, K. (2008). Play as a Literacy of Possibilities: Expanding Meanings in Practices, Materials, and Spaces. *Language Arts*, 127-136.

# APPENDIX

## APPENDIX A: REFLECTIONS

### ROXANNE BARTELS

This semester I have been working on a project in the squad Social and Physical Rehabilitation. This project is about visually impaired children and the bond with their parents. I have done this project with my team, in collaboration with Bartiméus. I will reflect on my personal development throughout this project, as well as my role in the group. I will focus on what went well, what I would like to improve and goals I would like to set for the future.

*Goals and gained knowledge*

At the beginning of the semester I set some goals that I wanted to reach by the end of the project. I can already say that I did not reach all of them, however I did discover new interests and made new goals based on that. One of my goals was to get more experience in user testing, since my last project only featured user tests with fellow students. This project really opened up opportunities for user testing with a difficult demographic, but it also made it harder to actually make an appointment for the user tests, because the parents were very protective of their young children. Another goal was to get better at programming, but throughout the project I realized I am not very interested in this, and therefore have very little motivation to do extra work for it. I know the basics of programming and I have come a long way with online tutorials, and for now I am satisfied with that. A goal that I didn't have at the start of the semester, but slowly grew into throughout the project is working with design programs. In a short period of time, I have learned to work with InDesign, Photoshop, and Corel Painter Essentials. I am very happy with these newly acquired skills because I have already been able to use them very often.

*Group communication*

At the start of this project, there were some communication issues between me and the group, but after some time I opened up to the group about personal problems I encountered and they helped me to feel more comfortable and contribute to the group in an efficient way. I did not necessarily take on any leader role but I did take initiative in some situations. I feel satisfied about the amount of work I contributed to the group, I believe we divided the workload quite equally.

*Future*

I really enjoyed this area of design. I have always cared about helping people and I would definitely like to do more in the Social and Physical Rehabilitation squad. I would also like to broaden my knowledge of the design programs even more. Lastly, this group has really motivated me to keep expectations of myself realistic, and ask for help when things get difficult, and I am determined to keep doing this in the future.

LEONIE COPRAIJ
Student ID: 1023204
B.2 department of Industrial Design

I will reflect upon my work for our project in the squad Physical and Social Rehabilitation about the stimulation of bonding between parents and children with a visual impairment. I will explain what went well, what went wrong, which goals are achieved, what my new goals are, what I have learned and why.

*Communication and group work*
During this project I have learned a lot about working and communicating in a group. How to arrange effective and non-effective meetings. How to make clear agreements and how expectations differ per person. My goal for this project was to have more serious meetings and an effective collaboration within the group. This is something that we developed during the project. Our meetings became more and more effective when someone or we as a group prepared the meeting on forehand. Also, accepting the fact that not everybody is proactive all the time helped me to organize breaks in between meetings or cancel early. We had a lot of meetings where some group members were absent. Therefore, we needed to communicate the outcomes of those meetings clearly. We noticed that notes that were made during the meeting had to be written down and elaborated right after the meeting. The techniques of planning meetings in front and writing down notes immediately are useful in future projects, because it will contribute to the group efficiency.
Something that worked for our group was discussing things when the collaboration was poorly. Once in a while, when I sensed that members or myself were not happy with the way things worked, I arranged a small meeting. Here we discussed our personal opinions about the progress of our project and the group work. This created a safe environment, because everybody listened to each other and was able to understand ones problems and arguments. I tend to create this safe environment during future projects as well, because I felt like nobody felt left out in our group.

*Start of the project*
I do feel like I could have started this project with a more proactive attitude. Instead, I waited for more information to come, rather than looking it up myself. I got overwhelmed when having to work with an actual client, but should have spoken up about our abilities as 2nd year students. In the future I hope to solve this lack of proactiveness by doing pre-research about the subject and thinking of ways to start, rather than waiting for someone else to start. I will try to prevent misunderstandings with the client, by making concrete plans, asking specific questions and being concrete about what we can and cannot do.

*Gain empathy and knowledge*
Some other goal of mine was to gain more empathy with the user. During the project we did a lot to understand the context and target group. We went to visit a tour at the museum for visual impaired people and talked to them about their impairment. I went to a toddler group of visual impaired children, to see how they interacted with toys and caregivers. We watched videos and read a lot of articles, and so on. I really enjoyed this way of gaining more knowledge and empathy with the user, how we explored different ways of gaining this. Now I know that the possibilities for gaining this knowledge are boundless and that I have to engage in as many activities as possible. We all know a lot about children with a visual impairment now and how to interact with them, and that was very valuable for our design process. This knowledge was also useful to support our concepts with strong arguments.

Because of that great amount of knowledge and information, I encountered problems with documenting this information correctly. Files went missing and notes puzzling. This could be prevented by documenting things properly and creating clear folders to save those documents in. Making use of keywords in a folder will also be a useful tool during future projects.

*Design phases*
Regarding my personal interests, I discovered which parts of the design process I liked and in which parts I need to develop more in order to stimulate my interests for them. I really liked the conceptualization and validation phase, because we could really use our knowledge about the subject in those phases. Every aspect of our design could be explained according to our research and I found new ways of narrowing all the feedback that we got down to what was useful for our design challenge

(by using criteria and codes to order the feedback, for example). Analyzing user tests was something that I had never done before, and I enjoyed learning new ways to do this. Regarding realization I have still a lot to learn, about thinking things over before trying it out immediately. But my knowledge about circuits did help when implementing the buttons. But I could have tried out more complicated techniques in order to challenge myself. The ideation phase is also where I feel stuck, at the beginning of every project. I could have tried to explore other techniques to brainstorm rather than only mind mapping, to see what works best for me. I did learn that talking to experts and observing user behavior contribute to my ability to come up with new ideas.

Concluding, I learned a lot about working in a group, organizing meetings, working with a client, processing a lot of data and gaining empathy with the user. I have to improve my ability to communicate with the client and to document data properly. Thereby, I need to start my projects with a more proactive attitude, by doing some research on forehand about the subject and so becoming enthusiastic to start the project. I also know more about what design phases I like and which I need to develop more in order to get more out of them. After all, I am proud of our end results and development both as a group and individual.

***1008 words***

KYARA FASEN

During project 2 I worked together with 4 other students in the squad Social and Physical Rehabilitation. Here we had the opportunity to do our project in cooperation with a client, the organization Bartiméus. Bartiméus provided us with the design challenge to find a solution that would help the bonding process between a parent and their visually impaired child between the ages of six months to three years old. This project was an important half year in my development as a designer as I've grown in many different aspects. Not all the goals I set in my B2.1 PDP where met, since during this project my focus shifted to different aspects of design I didn't anticipated at first but surely are equally important or, to me, even more important. My main areas of growth this project were: designing tactile experiences, professional skills, concept realization and user testing.

Possibly the area in which I grew the most is designing tactile experiences. I had absolutely no experience in this area. But as I recognized the importance of tactile experiences design products provoke and realized the opportunity this project had to offer in this area, I went for it. I learned how to sew on various machines and about differences in material properties between all sorts of fabrics in the Wearable Senses Lab. These skills make it possible for me to create a much larger variety of prototypes in the future, I future projects I will definitely come back here and keep improving these skills. Also the gained material knowledge provides me with a larger realization of what is possible, which is very valuable.

Professional skills was also a big area of growth for me these past months. I not only learned from the cooperation within my project group but also within my squad and most importantly from the cooperation with between my project group and a real client, the organization Bartiméus. Within all these forms of cooperation problems arose during the project. Long term sickness of teammates, miscommunication between parties, dealing with contradictory information and more. I am really proud of how I, and my team, were able to handle and overcome these inconveniences. I believe I grew as a person this half year and feel more prepared for work in professional settings like my internship next year.

During the realization phases of our project I learned multiple new techniques. Sewing, like mentioned above, but also laser cutting, soldering and the usage of different types of machines in Vertigo I had never used before e.g. the sander. I'm still far from perfect but I'm really glad that I now have a basis of woodworking, since it is a skill one really needs here at Industrial Design. I will continue working on this skill in upcoming projects. But I gained more than just physical prototyping skills during the realization phase. I worked with a drawing tablet for the first time and my life and improved my adobe InDesign and Illustrator skills while making the different booklets and posters. I will keep watching video tutorials about these programs online so my skills can continue to grow.

I also had the pleasure to perform one user test and analyze another with real users from our very specific and rare target group (visually impaired children between the ages of 6 months to 3 years old). It was really special to perform this user test because these users are so vulnerable and hard to reach. But also really challenging because these users are really difficult to read and can't be interviewed. The whole process was a valuable learning experience. Reaching the users, preparing the user test by doing research and talking to coaches, performing observations, performing interviews, analyzing the videos and the gathered data and seeking points of improvement so we could get even more helpful feedback in the second user test.

I believe that this project is the most important course I followed this year. While following it I improved all the skills I will need in my career as Industrial Designer. Not only the techniques I now understand and knowledge I gained but also my improved teamwork skills will definitely bring me closer to being a good designer in the future.

ISABEL LEUS

Starting this semester (B2.1) I would have never thought that I would have enjoyed doing a social project in a squad such as Physical and Social Rehabilitation. When reading one of my earlier PDPs from this semester I tended to look a bit down on the competence User and Society, since it seemed vague to me. Sometimes you get hungry at the table, to quote my teacher- and project coach Matthias Rauterberg.

When working together with Bartiméus on such a specific target group, you need to know more about this target group, so you need to start researching. Gaining insights from literature and related work on their probable difficult situation stimulates you to gain more insights and to design for their specific needs. These insights gave me more confidence while designing and user-testing. I really learned during this project to back up our design choices with these insights from literature and related work since being an academic designer means not just designing cause it seems fun, or is aesthetically pleasing, there has to be a reason why you designed your work is such way.

What was also new to me is to integrate other stakeholders than our initialized target group; such as, Paula, the children's parents, experts, outpatient counselor Minette Roza and our squad into our project and the dependence on them you can experience as a project group. We have experienced, for example, how difficult being able to reach these stakeholders can be.

When reading my PDP you will notice that I wrote that I wanted to focus on user testing. I always felt a bit nervous when doing user tests, especially with people who are not from our faculty. I have gained tools on how to prepare a user test, how to proceed when you are at location and how to analyze the data you collected. What I have for example learned is that it is clever to make already some sort of storyboard/planning on what to do beforehand. During the course Design <> Research, we learned even more about how to process this data.

I also mentioned in my PDP that the prototyping task will demand formgiving skills, which I gained during the course Basic Formgiving Skills. During this course I familiarized myself with the use of different materials, techniques and insights on formgiving which I wanted to use during our project. That is why I was really active on the prototyping side of the project. I noticed that I had more hands on experience when solving issues with the prototype, thanks to this course.

This semester I worked in a group filled with very structured persons. Something I am struggling with as long as I know is being structured, which has mainly to do with my ADD. This sometimes makes me feel like I am stupid, like why do they know this already? Being part of such structured team made me feel less confident, but was also very instructive. I find it hard to get a process started, where to begin? However, throughout the project I learned lots of methods from my fellow groupmates on how to ideate and initiate, but there is allot of room left for improvement. This is a point I will continue to work on in upcoming projects.

Our group got along very well, with the right balance of seriousness and fun. In the first few weeks of the project we had some startup problems. Partly because we did not have gotten the chance yet to meet with our client Paula from Bartiméus, partly since our first real squad meeting was planned in week 3 (which was already quite late), but mostly because of ourselves. Prof. Rauterberg told us to be more pro-active and do not wait till something happens. Pro-active means: look already for useful literature, talk with head of the squad and just don't sit and hope something will happen. He also advised us to point someone as the leader of the group and someone who does the external affairs with for example our client.

VEERLE VAN WIJLEN

I have done this project in the squad Physical and Social Rehabilitation in collaboration with the client Bartiméus. Bartiméus provided me and my project group with the problem of bonding between parents and their visually impaired child. In order to design for this we translated the problem into a design challenge, namely “how can we create/design playful objects that stimulate bonding between parents/caregivers and visually impaired children between 6 months and 3 years old?”

In the beginning of the project I set several goals linked to the areas of expertise. Unfortunately, I did not achieve all of them but changed them overtime to make sure I would succeed in doing those. Within the area of Technology & Realization I set the goal to improve my programming skills by programming several electronic components for prototypes during Project 2 Design. However, this was a missed opportunity for learning because the prototypes in this project were more focused on usability by the target group and creating the intended experience for the user tests. This by making use of material contrasts, textiles and simple electronic functions as buttons. These simple electronic functions did not need programming because they worked already within a simple circuit without using Arduino. Therefore I changed my goal to improving prototyping skills by learning sewing skills in the Wearable Senses Lab and sawing, drilling, gluing skills in the Vertigo workshop and apply it for every prototype needed. I clattered big pieces of soft materials; sewed lots of parts for the horse pillow (realization 1), cat ears and the cat pillow (realization 2 until 4), stitched bells on the tales of the cat (realization 3, 4). In Vertigo I learned to use several drill bits (house); work with the foam cutting machine (nose of cat); gluing different materials onto each other when working on the various prototypes. Because I missed the opportunity of improving my programming skills I will shift this goal to semester 2 by attending the course Making Sense of Sensors and trying to implement it in my design research project. This by using a prototype that needs programming of its components to use to gain knowledge about a specific research area.

In the area of User & Society I had 2 goals that I wanted to achieve because I have most interest in this area. That is also one of the reasons why I chose for a project in the Physical and Social Rehabilitation squad. I wanted to manage to get in touch with harder to reach target groups instead of choosing participants on convenience. Therefore, I chose Bartiméus as a client because visually impaired children are hard to reach because of their vulnerability and therefore protection against too many tests. To deal with this I chose to be one of the contact persons for communication with experts from Bartiméus. In this way I made appointments with them about the first user test. At the end of this first user test I managed to arrange a second test, by talking to the ambulant worker who was with us during the test, with a younger visually impaired child based on the results of the first user test. I learned to be pro-active, goal-driven, communicate clearly and to be patient. As a second goal I wanted to improve my user testing skills focusing on methods for executing qualitative user tests. In order to achieve this goal I did the first user test because then nobody of the group had any experience which challenged me to find out methods on my own. I learned about useful methods by Roos’ (Roos van Berkel, LMAnalysis) movement analysis workshop; asking Roos for advice. For communication methods, with visually impaired children, I looked at literature research (internet, books from Bartiméus) and observed the communication between Minette, ambulant worker, and the visually impaired child during the first user test. From this I learned to use several qualitative methods (interviewing, observation, interfere in play) in one user test to get the best results. Moreover I learned that having the right communication tools, as being patient, mimicking, asking, helps getting better results. This is useful when doing future user tests, which interests me, e.g. in the upcoming design research project and even in my internship.

I had not set goals within the area of Math, Data & Computing from the beginning but felt the urge to improve my data analyzing skills after doing the first user test. That is why I chose to organize discussion sessions after the two user tests to force myself to prepare useful analyzation methods and applying those together with my team mates. I learned to develop ways to organize lots of feedback from several stakeholders into useful compressed information for the follow-up iteration which gave me confidence in extracting the right information in an efficient way. Because I have the feeling that I made proper methods myself but that they lacked literature evidence I want to develop my analyzing skills further. This by attending the Design Research course this semester and doing the design research project upcoming semester.

Regarding the design process I learned to involve multiple stakeholders as the client, experts, users (visually impaired children) and parents to create a design that most suited their needs. I learned to

decide which feedback from whom to take with me into further design process stages and to communicate this to the client. What I found most important to take with me in future projects is that I learned to be more pro-active in doing the design process when it feels like I do not have enough information to carry on. For example, when the client has not provided specific information on the problem they want us to solve or when the arrangement of user tests goes slowly.

Concluding, I learned lots of new skills in the areas of Technology & Realization, User & Society and Math, Data & Computing and learned to be more pro-active in doing the design process. Because I missed the opportunity of improving my programming skills I will shift this goal to semester 2 by attending the course Making Sense of Sensors and trying to implement it in my design research project. Moreover, I want to develop my analyzing skills further because I have the feeling that I made proper methods myself in this project however they lacked literature evidence. This by attending the Design Research course this semester and doing the design research project upcoming semester.

## APPENDIX B: RECOMMENDATIONS

Several recommendations can be made regarding designing playful objects for bonding between parents and their visually impaired children in the age range of 6 months till 3 years old. These recommendations are made for designers who want to design in this area. They are based on our findings during the design process and on feedback we could not apply in our design anymore. The recommendations can be divided in 4 categories: child-safety, colors, bonding and interaction.

### CHILD-SAFETY

- The design must not have sharp edges or the edges should be marked with bright stripes/colors
- Electronic wires must not be reachable for the visually impaired children
- The design must be stable enough for visually impaired children to lean on
- The product should be cleanable/washable
- Make sure the design and its different features are not breakable
- Make sure loosened and/or features cannot be put into the visually impaired children's mouth by themselves

### COLORS

- Colors must be primary
- Colors must be bright
- Color contrasts must be used, to distinguish the different parts from each other (red and yellow worked for us)
    - Features as buttons need to be in a contrasting color than the surfaces surrounding them

### BONDING

- Similarity works for mirroring (e.g. 2 doors, 2 door bells, 2 windows etcetera, singing a song together)
    - In space: both opposite as besides to each other
    - In time: doing the same action together at the same time
- Time difference in action works for mirroring (e.g. imitating sounds and pressing button after each other)
- Make sure a variety in joint attention is possible by creating different interesting features (see Appendix B *Recommendations* INTERACTION)
- Connecting an action to something interesting as sound or textures, will encourage the child to repeat the action. Repeated actions increases bonding possibilities
- Make sure a two-way interaction is possible
    - Make sure that the action of the parent can be noticed by the visually impaired child and the other way around
- Encourage both exploring together as doing it by yourself
- Make sure parent and visually impaired child can play close to each other
- Stimulate direct and/or indirect, through a material, touch between parent and visually impaired child
- Create a narrative linked to the interactions and make use of storytelling, possibly by guiding the parent and child with a booklet
- Take the play-development stages of visually impaired children into account and link them to bonding techniques and the mentioned things above to make sure the children are able to practice them

### INTERACTION

- Make sure the interactions are playful and easy to perform
- When using buttons, preferably use RESET buttons, so that the child only have to press once to hear the sound
- Make sure different features are interesting by auditory, tactile and visual characteristics or combinations
    - When using auditory characteristics, map an action to recognizable sound

    - To evoke interaction with different object features make use of contrasting materials and/or textures
    - When using light, make sure both parent and child can operate this and that the intensity is high enough to be noticed by the visually impaired child
    - Enlarging features can create interest as well
- Create a narrative linked to the interactions and make use of storytelling
    - Make use of actions from daily life (e.g. going to grandparents, cooking, playing with pets) and objects from daily environment (e.g. pets, house and balls)
    - Avoid making use of details to prevent limited play behavior
    - Avoid pre-described play to prevent limited play behavior
- It is good to encourage visually impaired children to overcome fears with respect to reaching towards unknown spaces and objects for which the in-out game works (e.g. putting objects in another object and take them out)
- Make sure to encourage visually impaired children in their movement

# APPENDIX C: BOOKLETS

## APPENDIX $C_1$: ITERATION 1

*Booklet starts on next page*

# LUNA IN DE WEI

Vandaag gaan we de paarden bezoeken, kom maar mee!

***Suggestie voor ouder:***
*Begeleid uw kind naar het paard.*

Dit is Luna, Luna is een paard. Ze is heel groot, zo groot dat je op haar kan zitten.

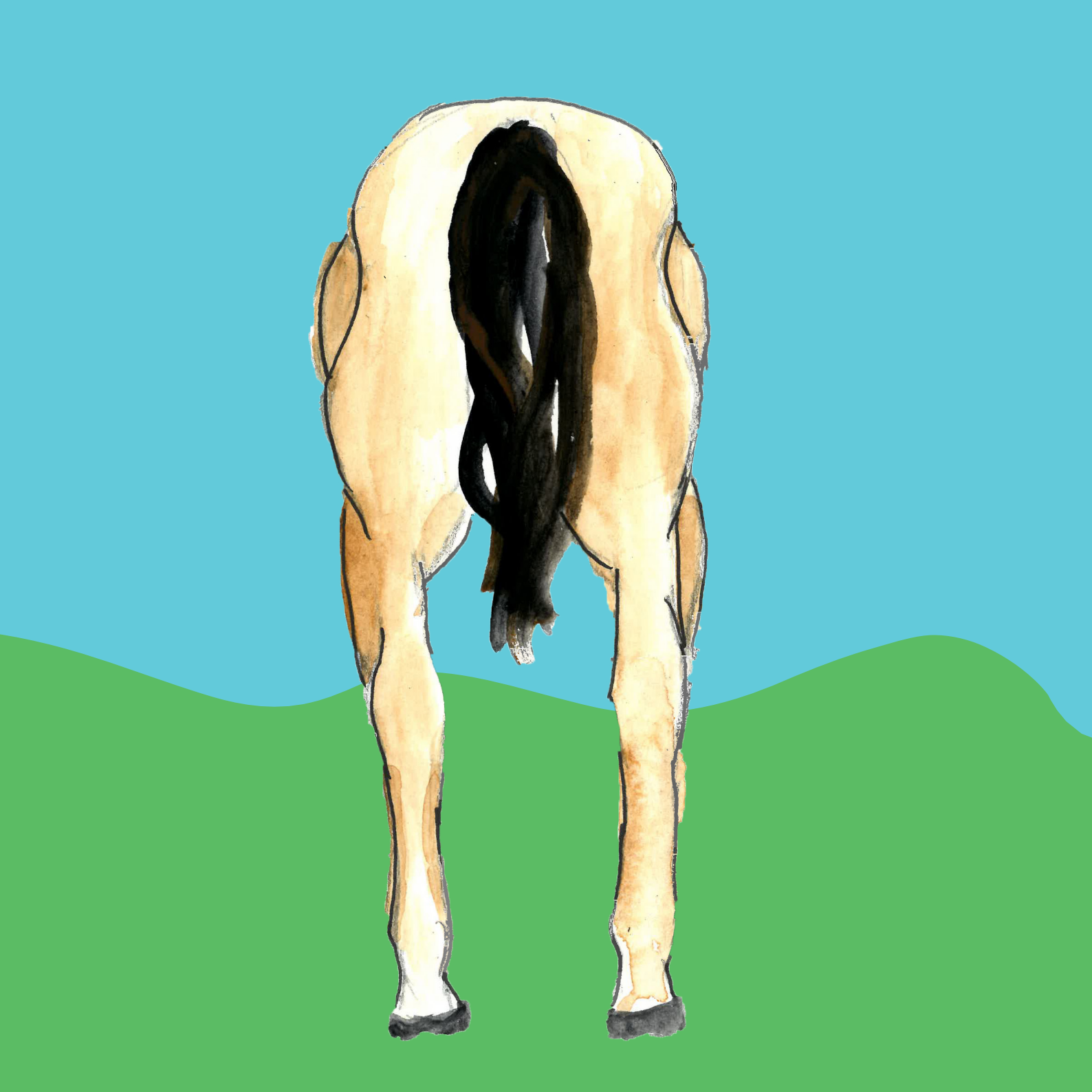
***Suggestie voor ouder:***
*Laat uw kind het paardrijden beleven. Bijvoorbeeld door op schoot te nemen en te hobbelen.*

Ze heeft een zachte vacht en mooie lange manen en een staart. Voelt het anders dan jouw haar?

***Suggestie voor ouder:***
*Voel samen aan het haar van het paard.*
*Voel aan elkaars haar.*


Paarden maken verschillende geluiden, Luna hinnikt als je aan haar staart trekt.

***Suggestie voor ouder:***
*Trek aan de staart. Doe samen het geluid na en voel elkaars gezicht.*



APPENDIX $C_2$: ITERATION 2

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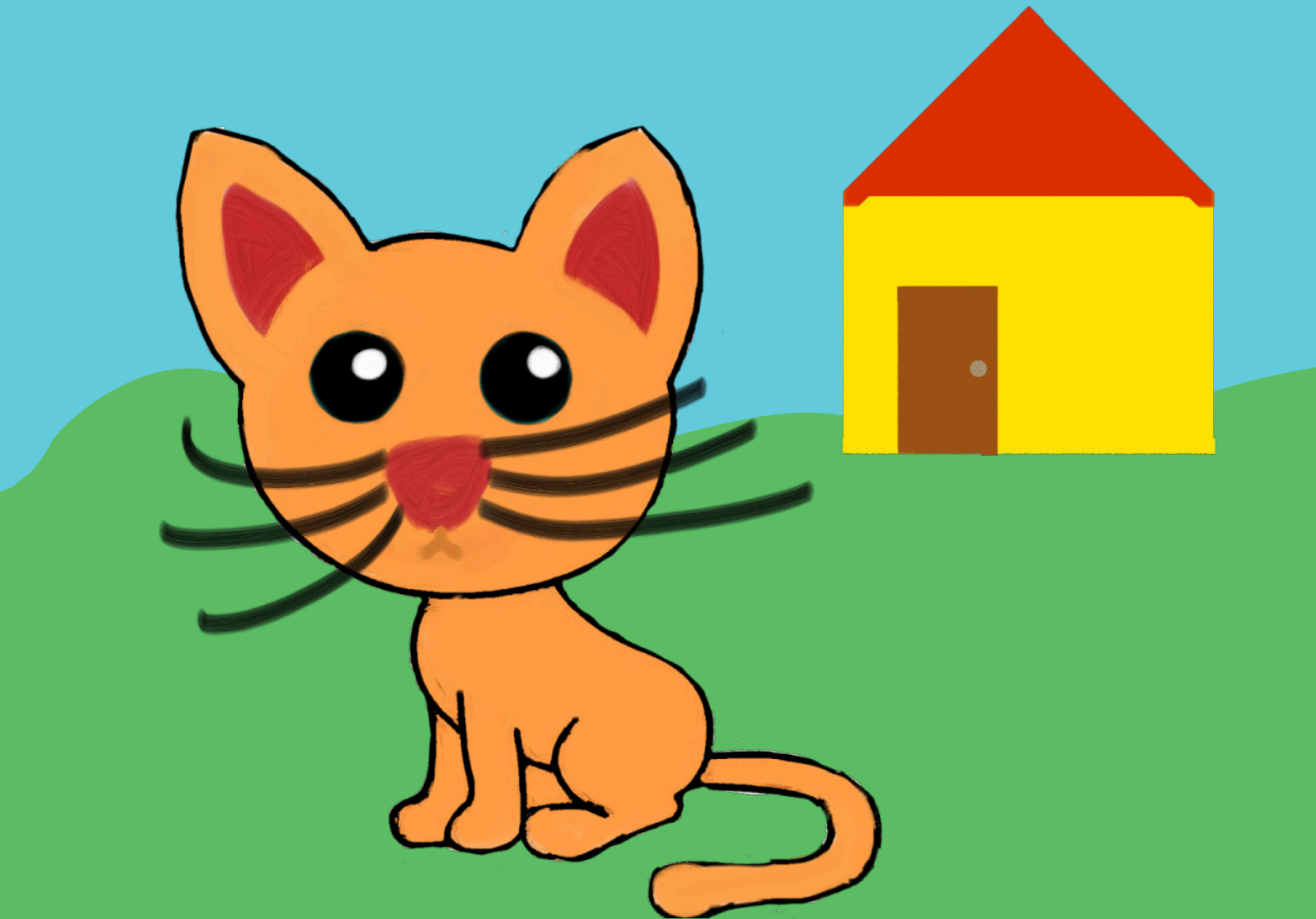
# SAAR OP WEG NAAR HUIS

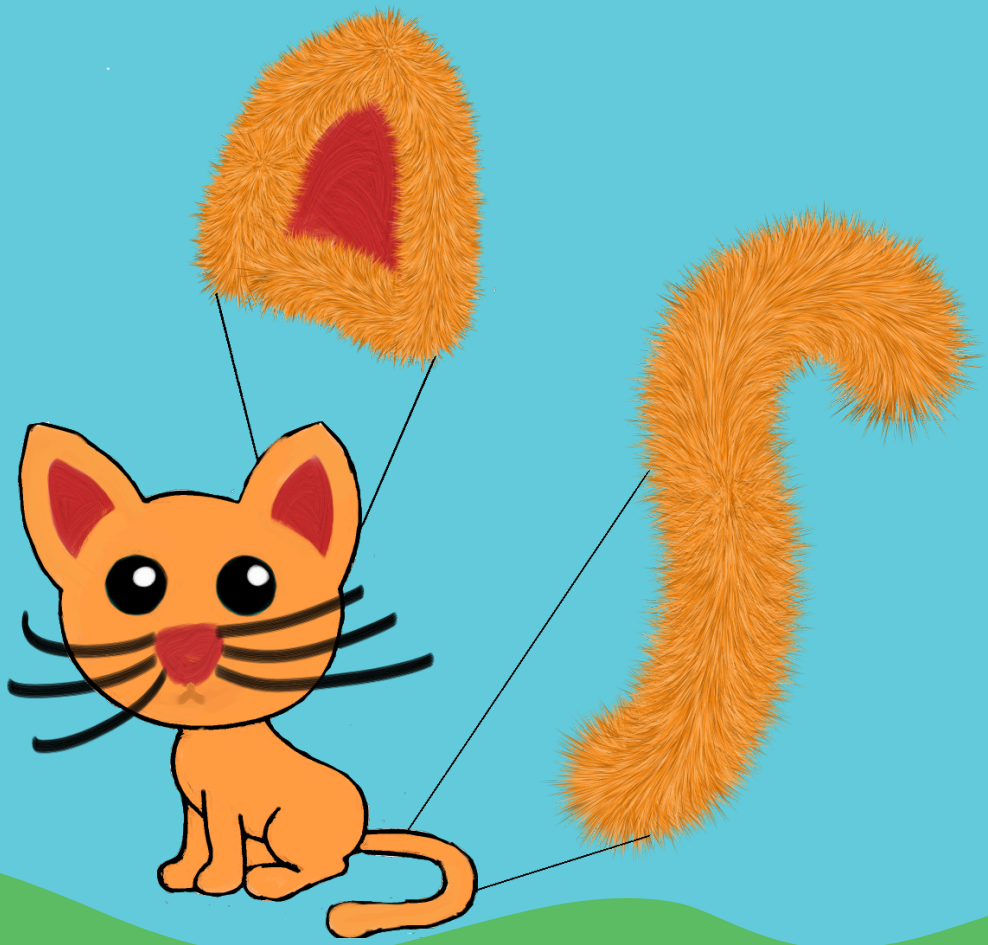


Kijk, daar zit de kat! Zullen we haar aaien?

***Suggestie voor ouder:***
*Laat uw kind de kat exploreren. Wanneer hij of zij uitgekeken is, ga dan verder met het verhaal om nieuwsgierigheid uit te lokken.*

De kat heet Saar en is onderweg naar huis. Ze heeft dikke snorharen die alle kanten op kunnen bewegen. Probeer het maar!

***Suggestie voor ouder:***
*Voel samen de snorharen, buig ze.*



Ze heeft oortjes en een lange staart. Die zijn heel zacht, voel maar! Zijn jouw oren ook zo zacht?

***Suggestie voor ouder:***

*-Voel samen de harige delen van de kat.*

*-Voel elkaars oren.*


Saar maakt ook geluidjes, druk maar eens op haar neus. Soms doen katten “miauw”, soms doen ze “prrr”, dat heet spinnen. Kan jij dat ook?

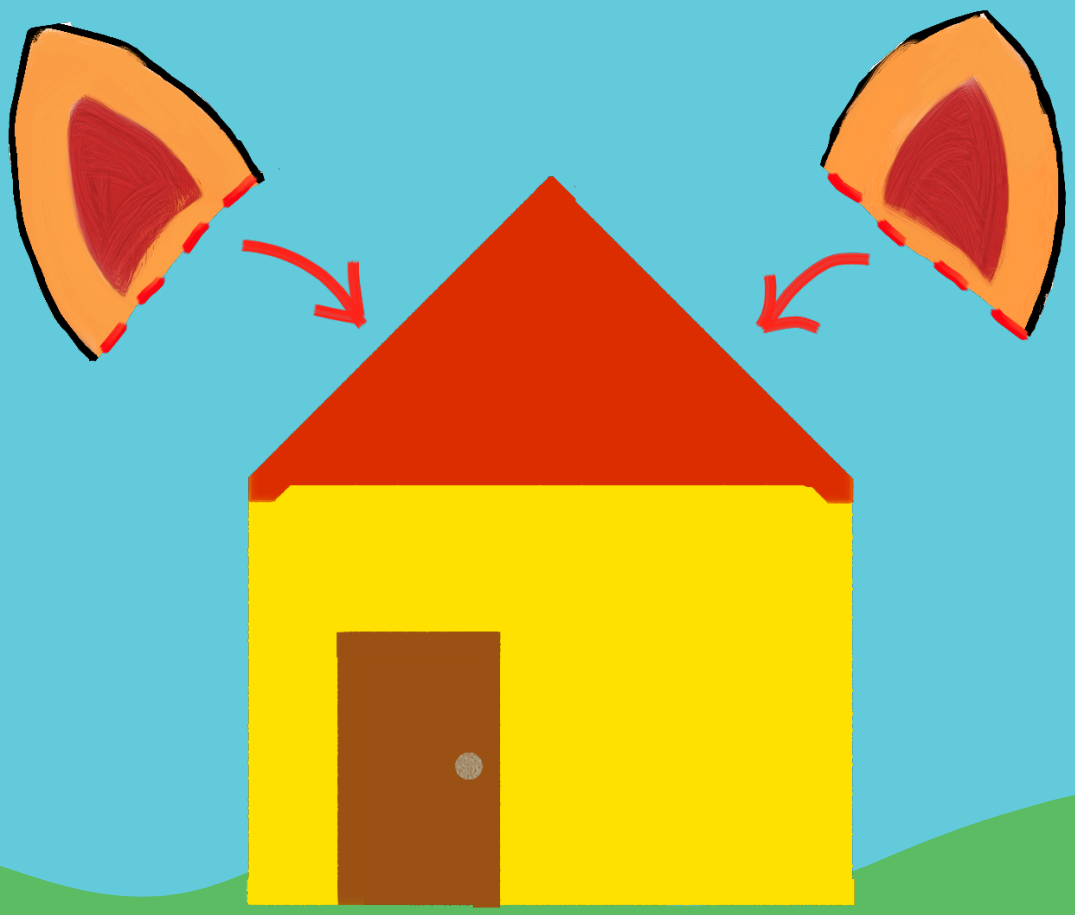
***Suggestie voor ouder:***

*-Druk op haar neus, doe samen de geluidjes na.*

*-Voel hoe elkaars gezicht beweegt.*

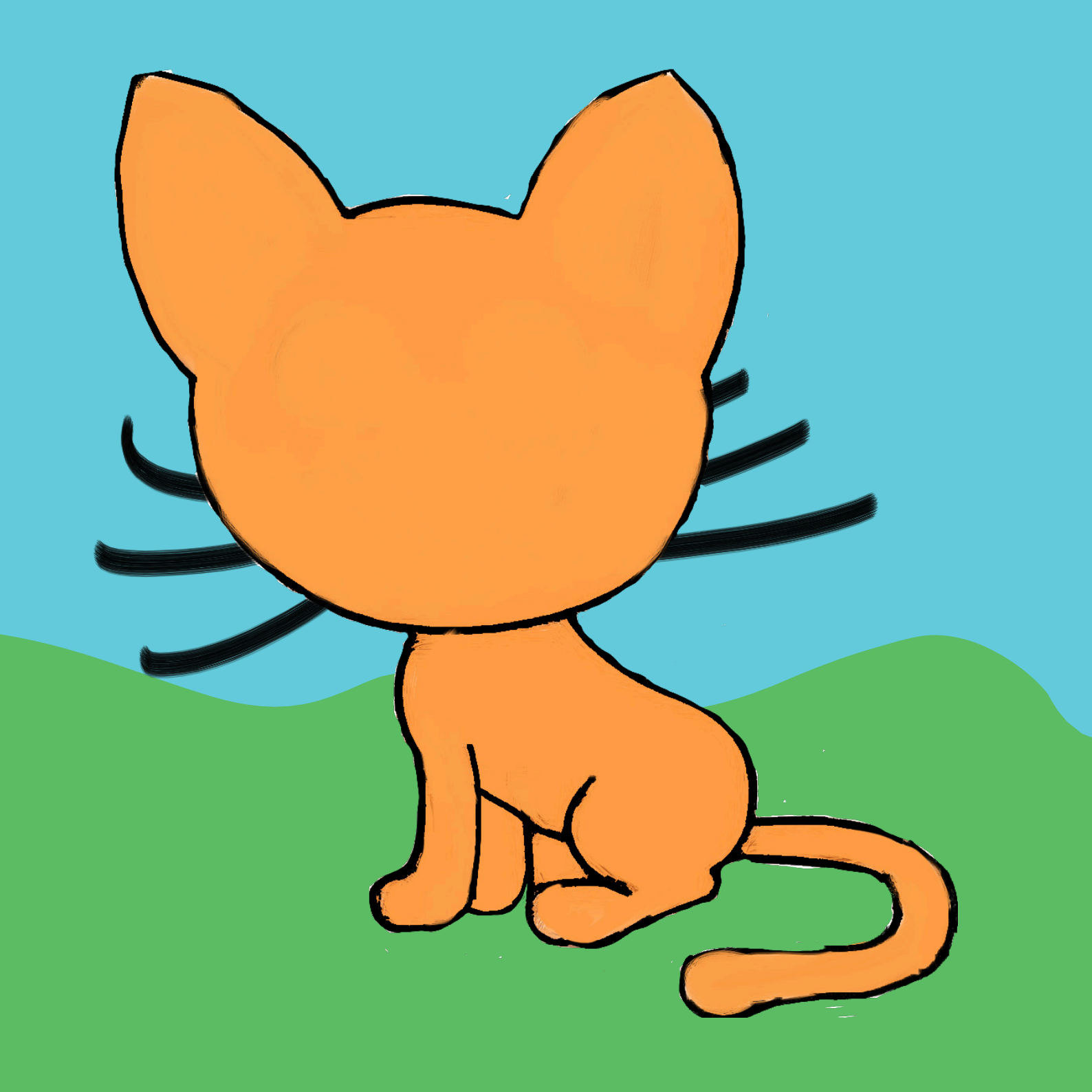
Saar is bijna thuis, maar jij moet haar oortjes helpen naar binnen te komen. Bij Saar kunnen de oortjes los. Trek er maar eens voorzichtig aan.

***Suggestie voor ouder:***
*Maak allebei een oortje los.*



Bel maar aan en leg de oortjes binnen.
Goed gedaan! Saar is weer veilig thuis. Zullen we een liedje zingen om het te vieren?

***Suggestie voor ouder:***
*-Doe ieder een luikje open en stop de oortjes er in.*
*-Zing "Poesje Mauw"*



APPENDIX $C_3$: ITERATION 3

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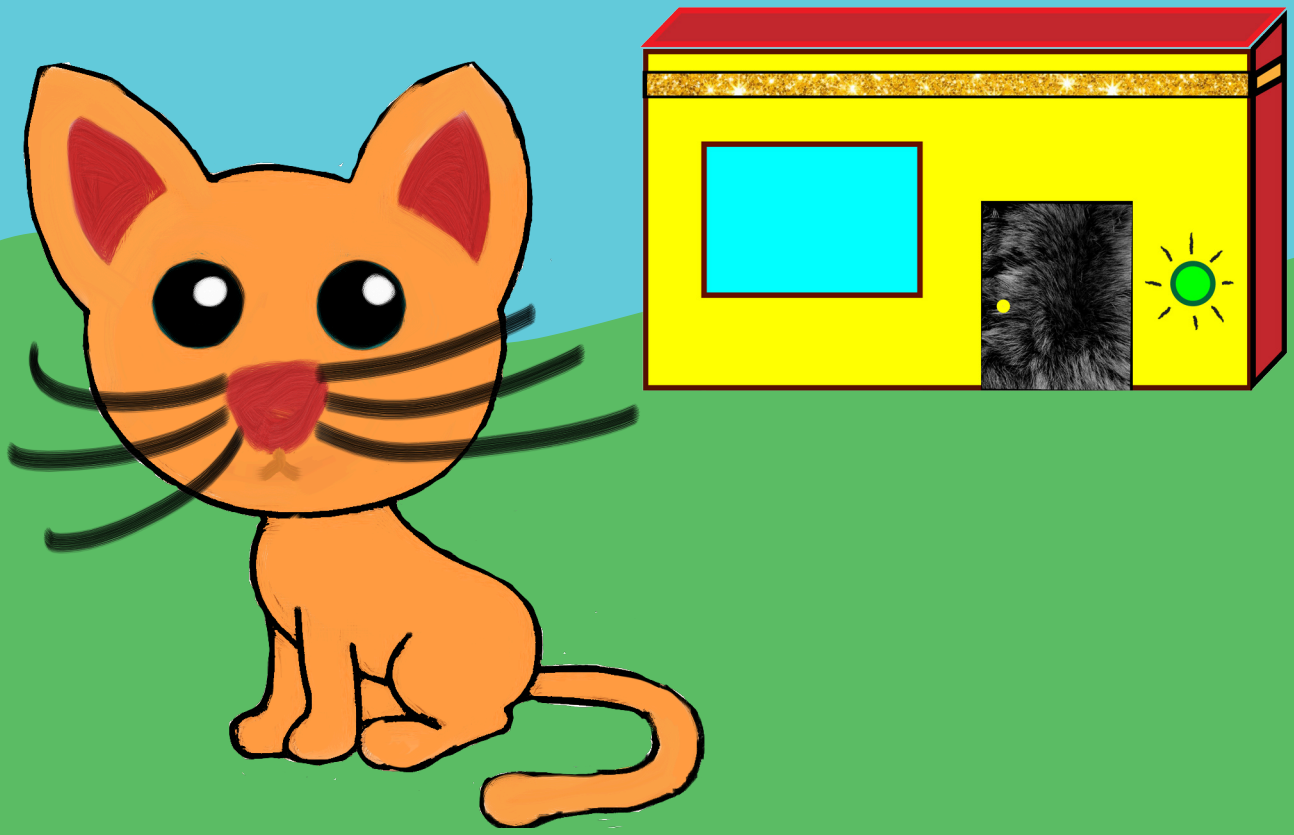
# SAAR OP WEG NAAR HUIS



# Introductie

Beste ouder/ verzorger,
Dit boekje is ontwikkeld ter ondersteuning bij het spelen met zowel de kat als het huisje. De suggesties die in het boekje staan zijn optioneel, maar kunnen wel bevorderend zijn voor de band tussen u en uw kind. Het is bewezen dat samen spiegelen en gezamenlijke aandacht de band versterken en daar zullen de suggesties zich dan ook op focussen. Spiegelen betekent het nadoen van de ander door hetzelfde te bewegen/praten, dit kan zowel vanuit u als vanuit uw kind ontstaan.

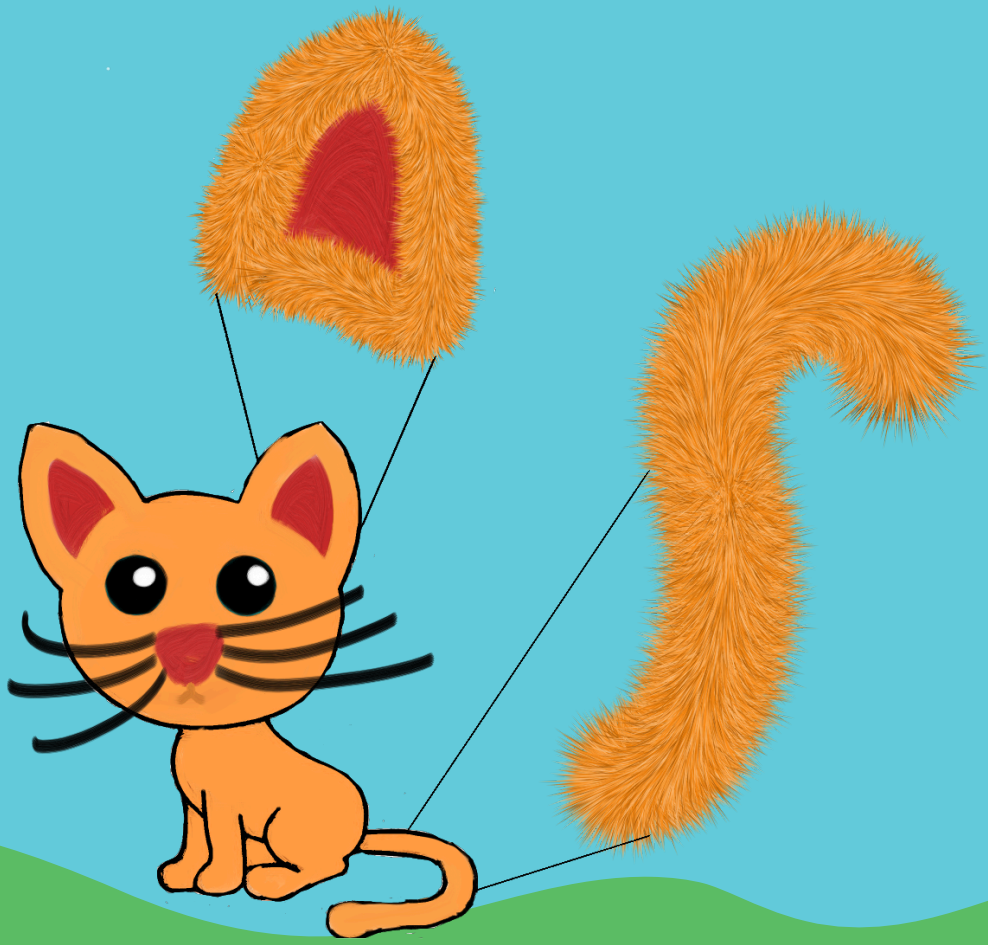
Probeer met de fantasie van uw kind mee te gaan, om zo nieuwe speelmogelijkheden te ontdekken. Daarbij komt u er op deze manier achter wat de voorkeuren zijn van uw kind. Sommige suggesties zullen wellicht te veel gevraagd zijn voor het speelniveau van uw kind, maar kunnen later interessant zijn om eventueel te proberen. Wij wensen u en uw kind veel speelplezier!

Kijk, daar zit de kat! Zullen we haar aaien?

***Suggestie voor ouder:***
*Ga samen met uw kind de kat exploreren. Wanneer hij of zij uitgekeken is, ga dan verder met het verhaal om nieuwsgierigheid uit te lokken.*

De kat heet Saar en is onderweg naar huis. Ze heeft dikke snorharen die alle kanten op kunnen bewegen. Probeer het maar!

***Suggestie voor ouder:***
*Voel samen de snorharen, buig ze.*



Ze heeft oortjes en een lange staart. Die zijn heel zacht, voel maar! Zijn jouw oren ook zo zacht?

***Suggestie voor ouder:***

*-Voel samen de harige delen van de kat.*

*-Voel elkaars oren.*


Saar maakt ook geluidjes, druk maar eens op haar neus. Soms doen katten “miauw”, soms doen ze “prrr”, dat heet spinnen. Kan jij dat ook?

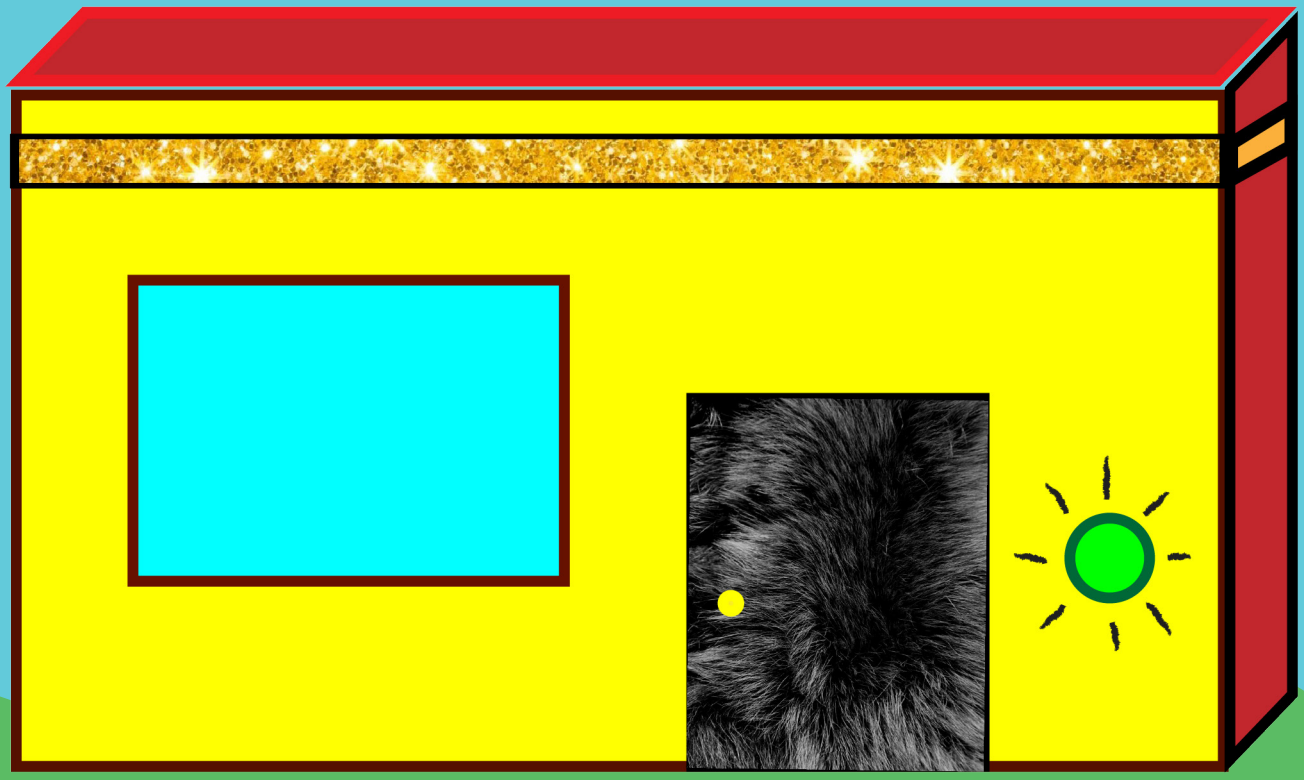
***Suggestie voor ouder:***

*-Druk op haar neus, doe samen de geluidjes na.*

*-Voel hoe elkaars gezicht beweegt.*

Saar is bijna thuis, maar jij moet haar oortjes helpen naar binnen te komen. Bij Saar kunnen de oortjes los. Trek er maar eens voorzichtig aan.

***Suggestie voor ouder:***
*Maak allebei een oortje los.*
*Kijk wat je allemaal met de oortjes kan doen: je hand kan erin of je kan het kind ermee kietelen.*

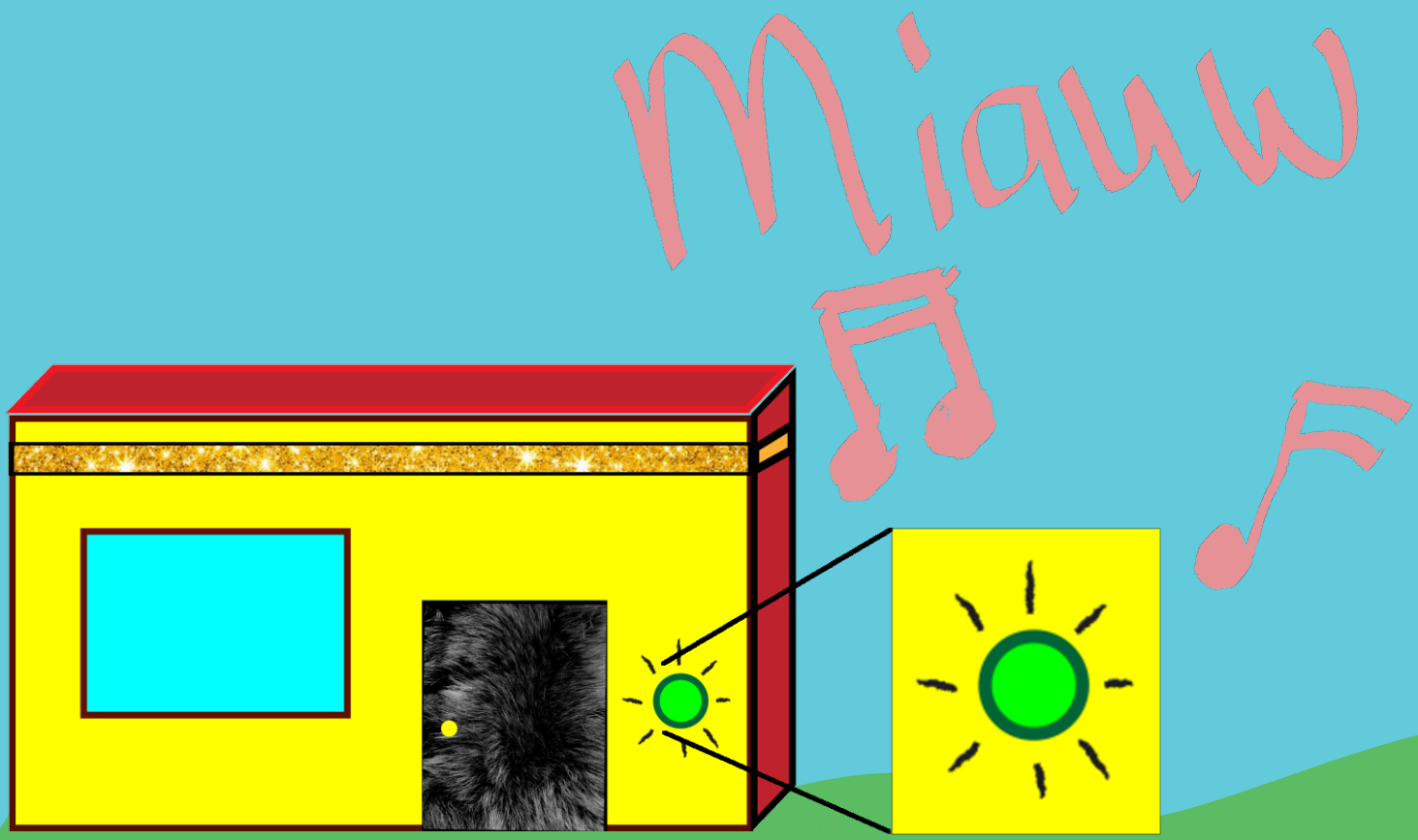


Kun jij het huisje van Saar ontdekken?
Ja! Het is dat gele huisje daar, zullen we dat eens gaan bekijken?

***Suggestie voor ouder:***

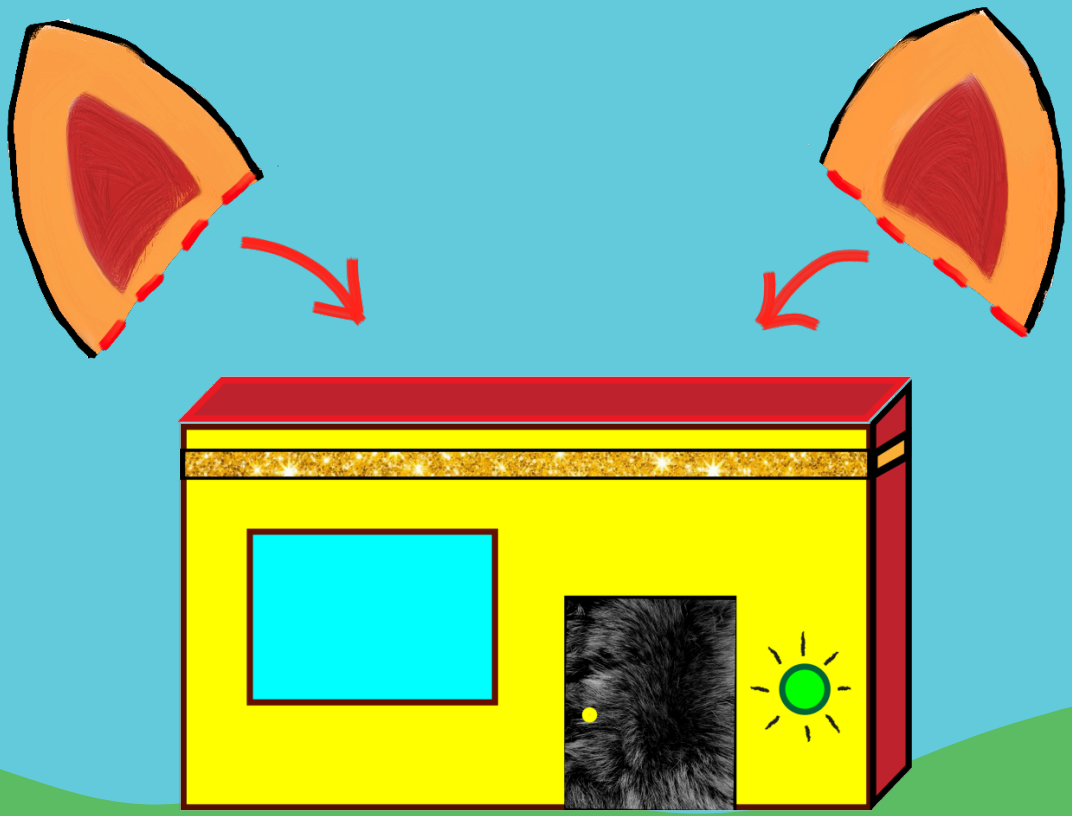
*-Ontdek het huisje samen met uw kind (knopjes, vacht, deurtjes en ramen)*

*-Ga aan de andere kant van het huis-je zitten en probeer uw kind te (laten) spiegelen*



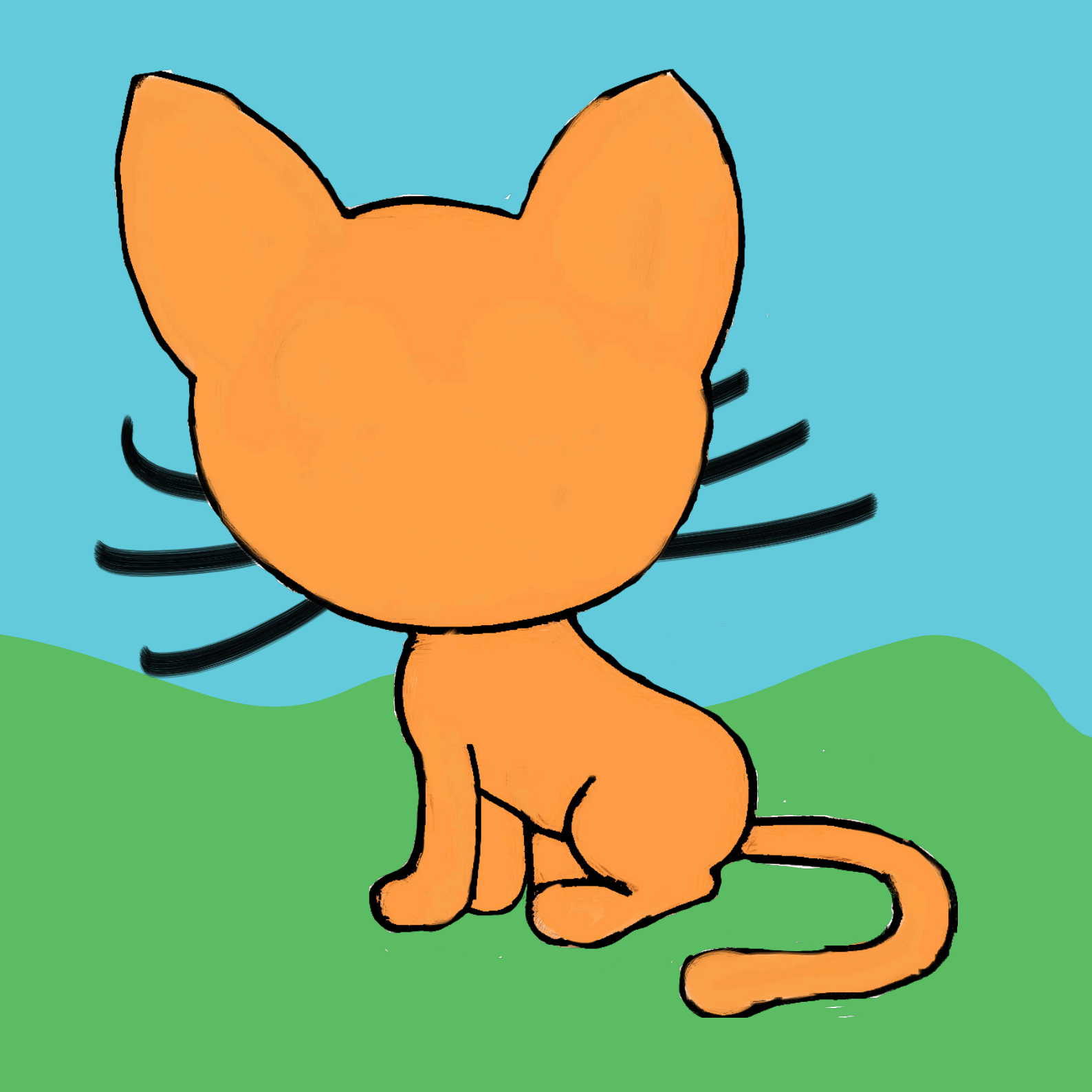

Er zitten ook deurbellen op het huisje! Misschien is er wel iemand thuis.
Zullen we samen aanbellen?

***Suggestie voor ouder:***
*-Kan het kind het geluid van de deurbel linken aan het geluid van de kat?*
*-De deurtjes kunnen ook open en dicht, probeer samen elk aan een kant van het huisje door de deuren/ramen naar elkaar te kijken.*



Passen de oortjes van Saar misschien in het huisje?
Als ze binnen zijn kan Saar eindelijk gaan slapen.
Welterusten Saar!

***Suggestie voor ouder:***
*-Er zit ook een lichtknopje op het huisje, als Saar gaat slapen kan het licht uit.*
*-Zing samen "Slaap poesje slaap" of een ander liedje.*



APPENDIX $C_4$: ITERATION 4

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# SAAR OP WEG NAAR HUIS

# Introductie

Beste ouder/ verzorger,
Dit boekje is ontwikkeld ter ondersteuning bij het spelen met zowel de kat als het huisje. De suggesties die in het boekje staan zijn optioneel, maar kunnen wel bevorderend zijn voor de band tussen u en uw kind. Het is bewezen dat samen spiegelen en gezamenlijke aandacht de band versterken en daar zullen de suggesties zich dan ook op focussen. Spiegelen betekent het nadoen van de ander door hetzelfde te bewegen/praten, dit kan zowel vanuit u als vanuit uw kind ontstaan.

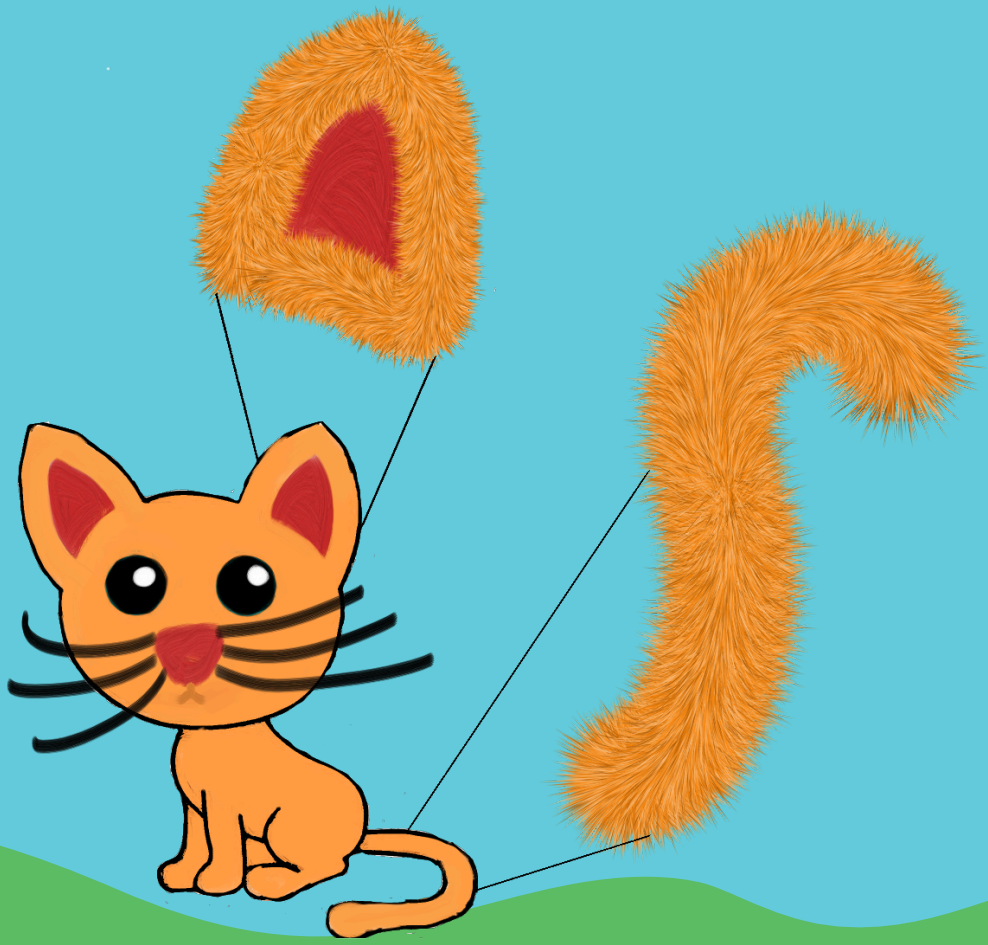
Probeer met de fantasie van uw kind mee te gaan, om zo nieuwe speelmogelijkheden te ontdekken. Daarbij komt u er op deze manier achter wat de voorkeuren zijn van uw kind. Sommige suggesties zullen wellicht te veel gevraagd zijn voor het speelniveau van uw kind, maar kunnen later interessant zijn om eventueel te proberen. Wij wensen u en uw kind veel speelplezier!

Kijk, daar zit de kat! Zullen we haar aaien?

***Suggestie voor ouder:***
*Ga samen met uw kind de kat exploreren. Wanneer hij of zij uitgekeken is, ga dan verder met het verhaal om nieuwsgierigheid uit te lokken.*

De kat heet Saar en is onderweg naar huis. Ze heeft dikke snorharen die alle kanten op kunnen bewegen. Probeer het maar!

***Suggestie voor ouder:***
*Voel samen de snorharen, buig ze.*



Ze heeft oortjes en een lange staart. Die zijn heel zacht, voel maar! Zijn jouw oren ook zo zacht?

***Suggestie voor ouder:***

*-Voel samen de harige delen van de kat.*

*-Voel elkaars oren.*


Saar maakt ook geluidjes, druk maar eens op haar neus. Soms doen katten “miauw”, soms doen ze “prrr”, dat heet spinnen. Kan jij dat ook?

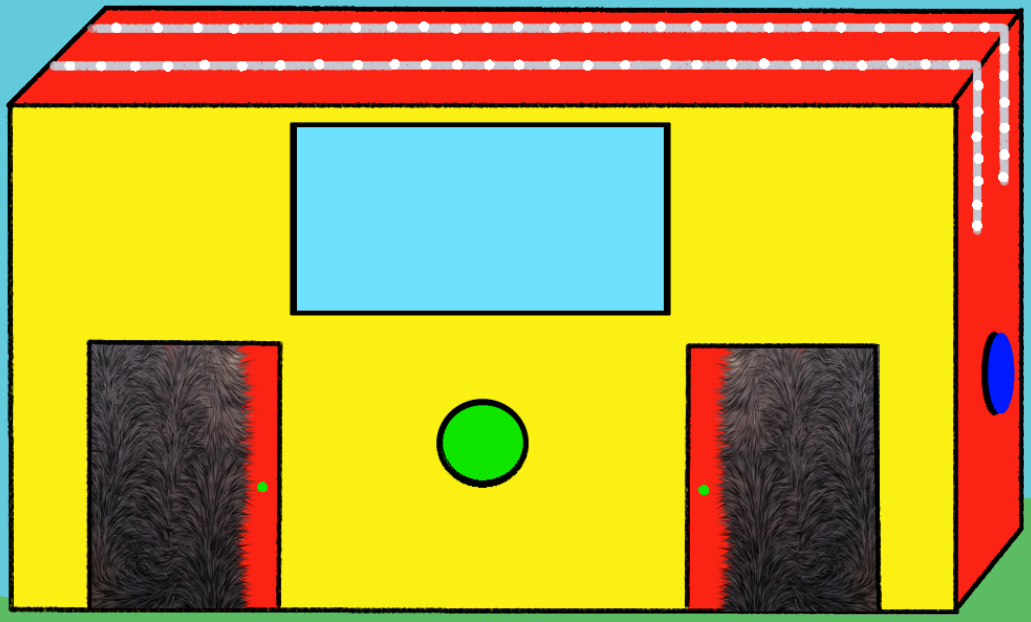
***Suggestie voor ouder:***

*-Druk op haar neus, doe samen de geluidjes na.*

*-Voel hoe elkaars gezicht beweegt.*

Saar is bijna thuis, maar jij moet haar oortjes helpen naar binnen te komen. Bij Saar kunnen de oortjes los. Trek er maar eens voorzichtig aan.

***Suggestie voor ouder:***
*Maak allebei een oortje los.*
*Kijk wat je allemaal met de oortjes kan doen: je hand kan erin of je kan het kind ermee kietelen.*

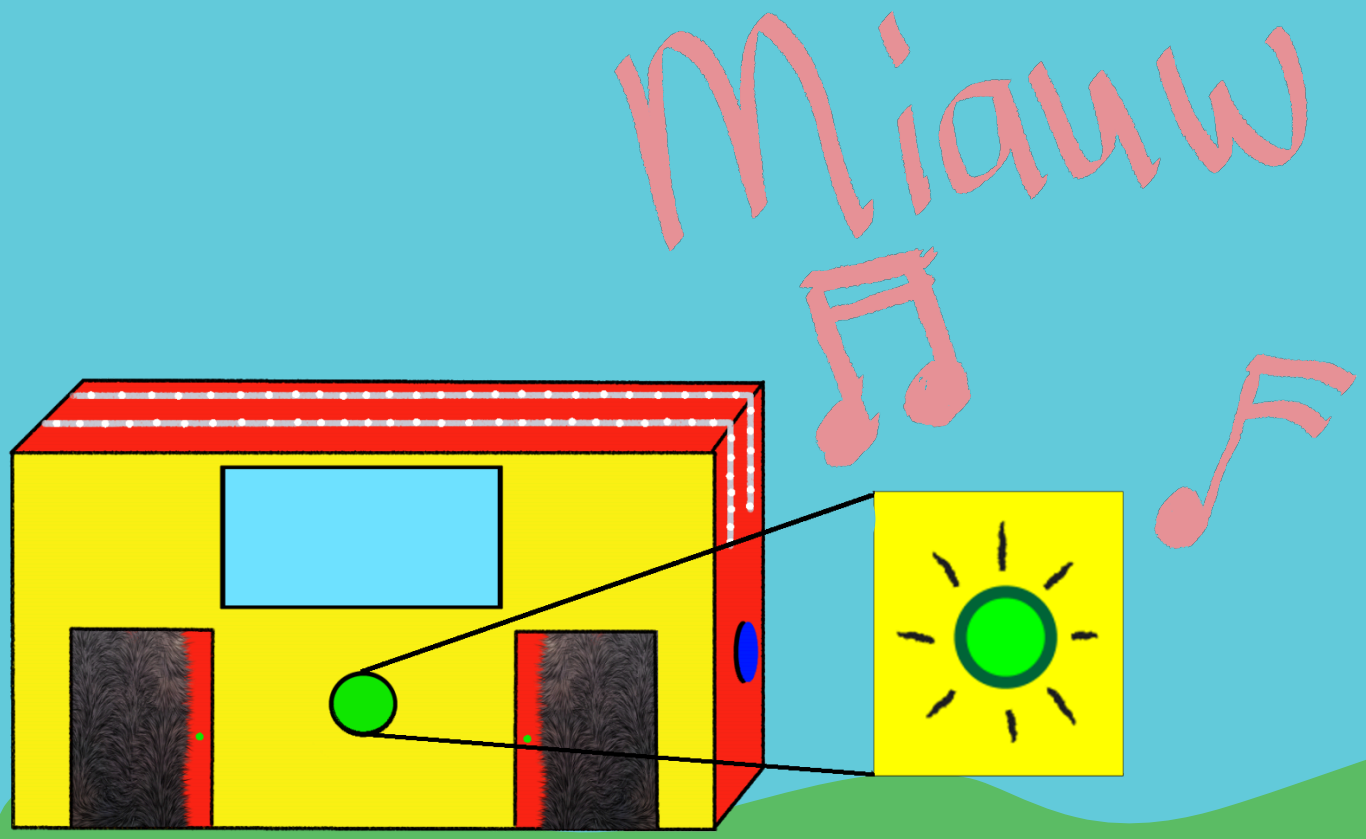


Kun jij het huisje van Saar ontdekken?
Ja! Het is dat gele huisje daar, zullen we dat eens gaan bekijken?

***Suggestie voor ouder:***

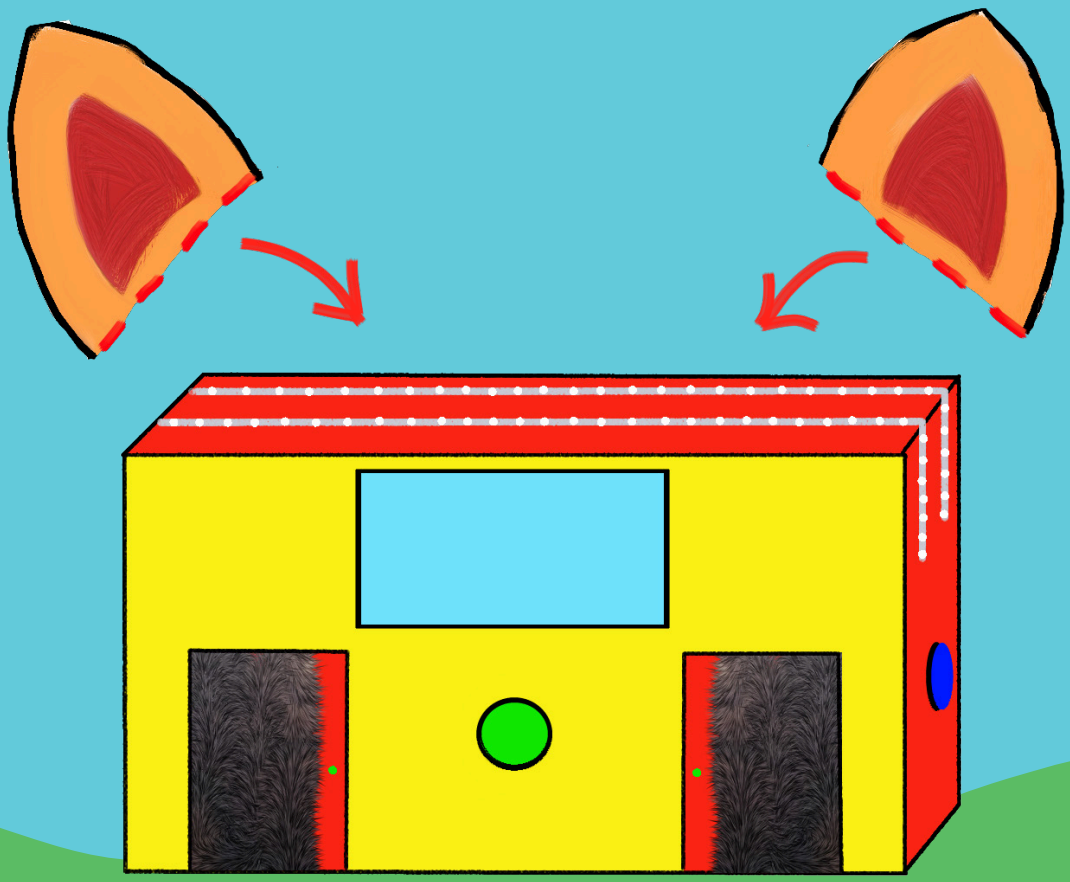
*-Ontdek het huisje samen met uw kind (knopjes, vacht, deurtjes en ramen)*

*-Ga aan de andere kant van het huis-je zitten en probeer uw kind te (laten) spiegelen*



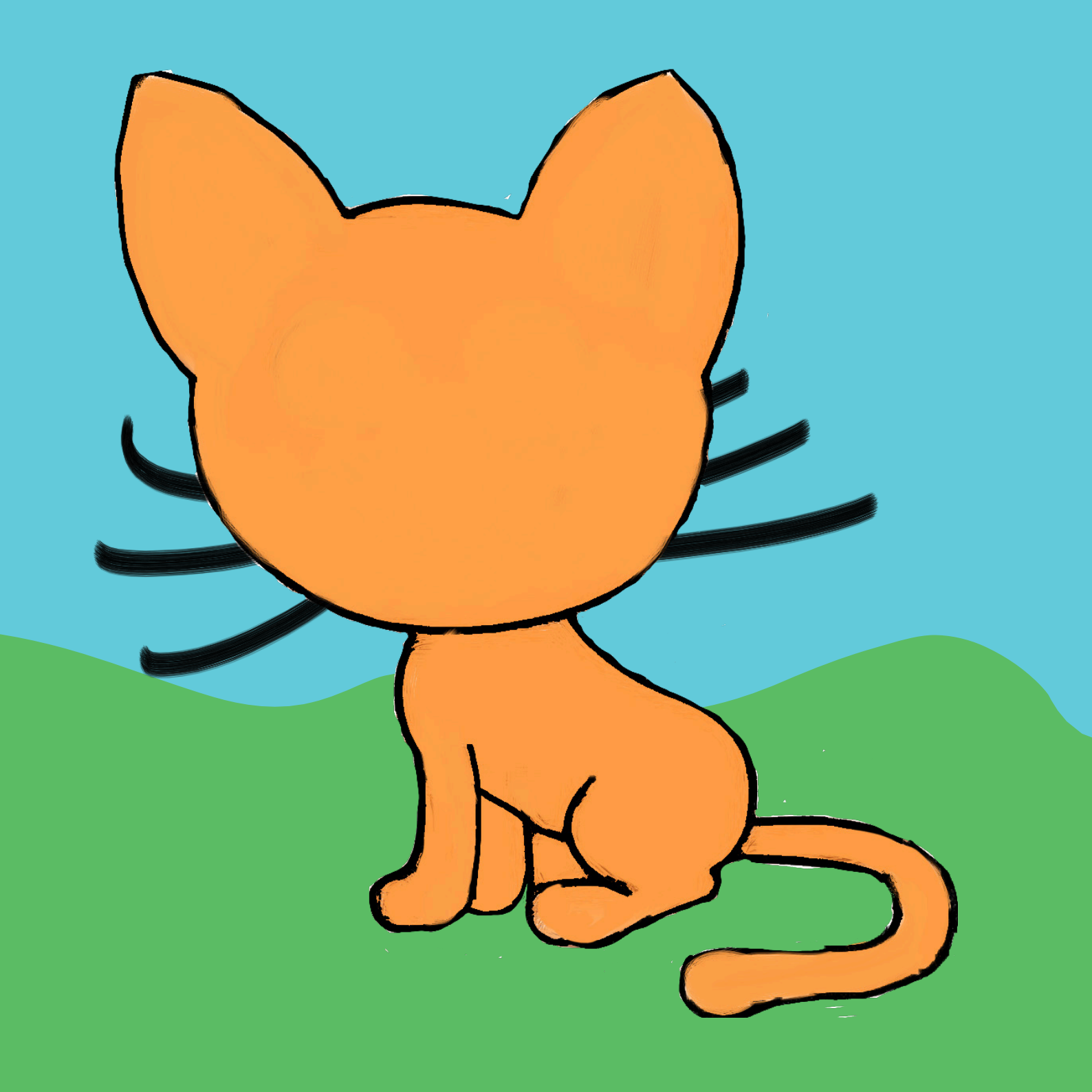

Er zitten ook deurbellen op het huisje! Misschien is er wel iemand thuis.
Zullen we samen aanbellen?

***Suggestie voor ouder:***
*-Kan het kind het geluid van de deurbel linken aan het geluid van de kat?*
*-De deurtjes kunnen ook open en dicht, probeer samen elk aan een kant van het huisje door de deuren/ramen naar elkaar te kijken.*



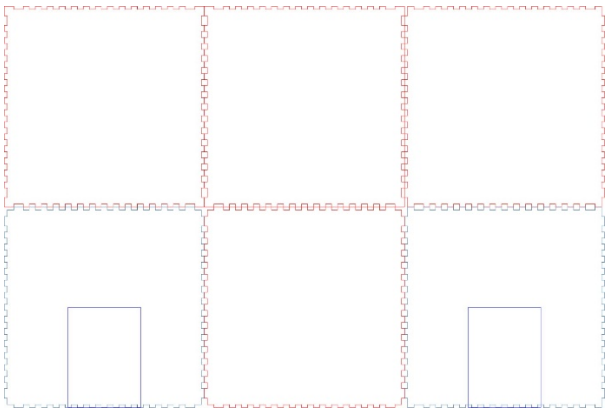
Passen de oortjes van Saar misschien in het huisje?
Als ze binnen zijn kan Saar eindelijk gaan slapen.
Welterusten Saar!

***Suggestie voor ouder:***
*-Er zit ook een lichtknopje op het huisje, als Saar gaat slapen kan het licht uit.*
*-Zing samen "Slaap poesje slaap" of een ander liedje.*

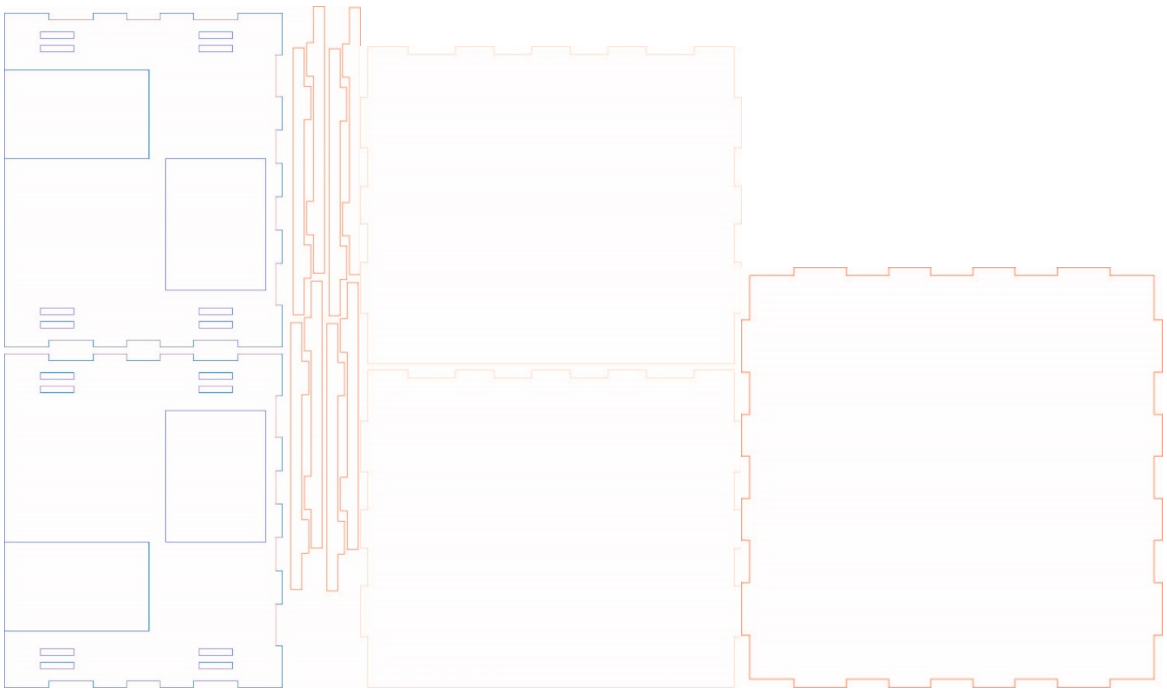


# APPENDIX D: LASERCUT FILES

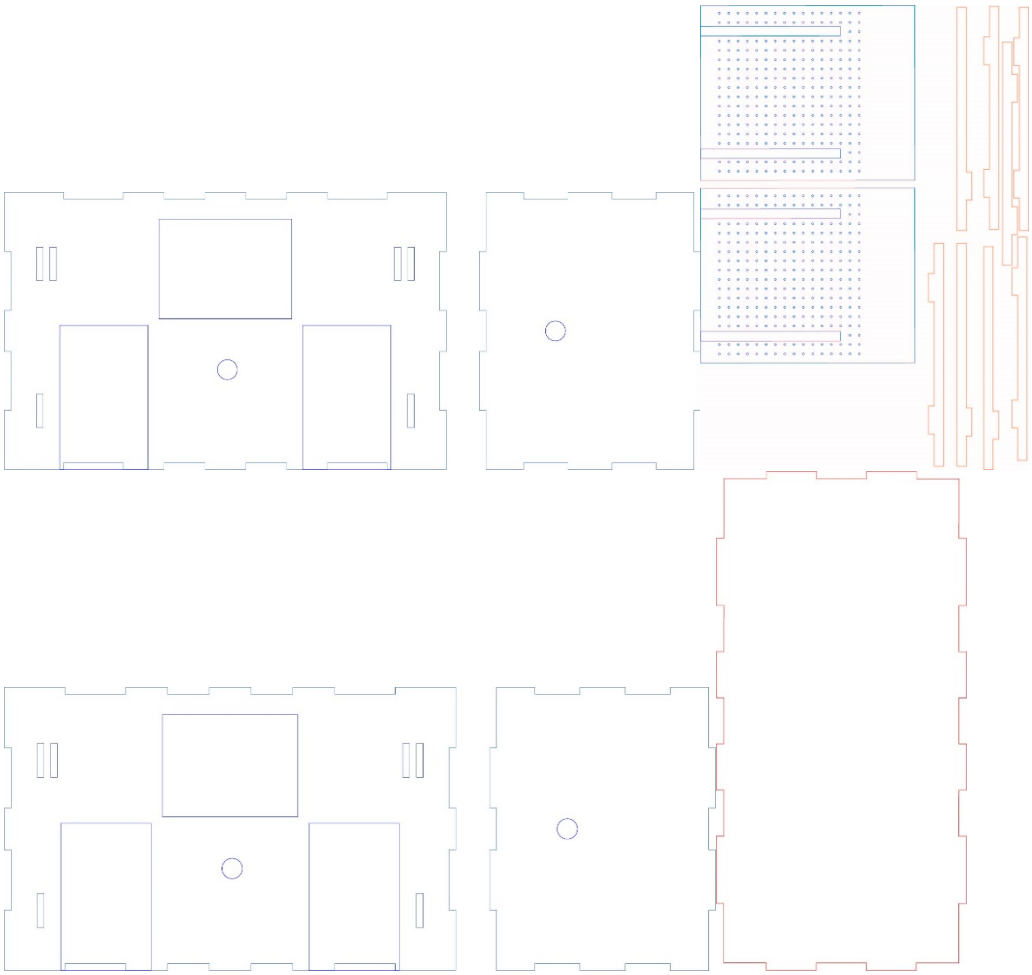
## APPENDIX $D_1$: LASTERCUT 1



## APPENDIX $D_2$: LASERCUT 2



APPENDIX $D_3$: LASERCUT 3



# APPENDIX E: FEEDBACK MIDTERM DEMO DAY

## APPENDIX $E_1$: FEEDBACK MIDTERM DEMO DAY

Play mat:

- Use real smell and fur?
- Different animals on different pillows (puzzle mat)
- Why in animal shape?
- Pull a cord for sound (like a talking doll)
- Why 2D? make it 3D → pop-up
- Warmth = nice

Booklet:

- Does a parent really need guidance?
- Make different booklets with different stories
- Make a story that visits multiple animals

Whole concept:

- How does it fit all ages?
- Is it a farm simulation? or a product for bonding?
- How big will it be?
- Don’t let it smell! has to be useable in a house
- Don’t make it too big / think about storability → has to fit in house

Project:
- What do we want? goal for the end of the project
- What indicators would we like to test in user test (cause bonding can't be tested)
- Prevent pleasing from the parents in user test feedback (make anonymous feedback form)
- Test concept with children who can see

Recommended information sources:
- Hugsy → also stimulates bonding
- Furreal friends
- Visit nemo → design an experience

Positive feedback:
- Nice set-up!
- Good work!
- Clear pitch

APPENDIX $E_2$: FEEDBACK MIDTERM BARTIMEUS

Target group:
- Almost none of the children is totally blind
- Make sure parent and child can be close together
- Soft and vervormbare materials are not pleased → but child needs to learn how to handle these materials
- 70% of the children has another disability next to visual impairment
- Work with contrast and colors (not with details)

Bonding:
- Action → reaction isn't mirroring

Aesthetics mat:
- Uitvergroten kenmerken dier, niet heel paard maar stukje vacht, oren, staart (voel boekje, je voelt nooit heel het dier)
- Make everything BIG
- Choose animals that are close to the children (cat, dog, bunny, sheep → NOT cow, elephant, etc) choose animals they can also feel irl in their environment
- Animals on separate pillows (that can be connected)
- Has to be washable!! (losse kussensloop / elektronica die er makkelijk uit kan / water afstotende onderlaag)

Story book:
- Different levels in the difficulty of challenge suggestions for parents (fun for really young children, but still fun for older children)
- Booklet great addition to the concept! challenges really nice addition (mimicking = amazing, touching = amazing)

Positive feedback:
- Sound in mat + making sounds together (booklet) really fun!

FEEDBACK ON QUESTIONAIR DISTRIBUTED BETWEEN BARTIMÉUS EMPLOYEES
Welke technieken raad u ouders aan in uw werk om de band met hun kind met een visuele beperking te versterken?
3 reacties
- Professional 1: We bieden binnen Bartiméus en Visio de VIPP-V cursus aan

- Professional 2: Lichamelijk contact, auditieve aanwezigheid/spelletjes, visuele stimulatie, spelen met nabijheid (voordoen/nadoen = spiegelen)

- Professional 3: Voorspelbaarheid, lichamelijke nabijheid, lichaamsgerichte spelletjes ( bv schootspelletjes),knuffelen, aanraken, vertellen wat er gaat gebeuren, contact openen en weer sluiten, tijd geven en herhalen.

In hoeverre denkt u dat bonding door spiegelen (elkaar nadoen) mogelijk is voor kinderen met een visuele beperking?
3 reacties

- Professional 1: Ik (Paula) ben hiermee eens!

- Professional 2: Goed mogelijk, je kunt spiegelen ook door gebruik te maken van lichamelijk contact, nabijheid, volgen van bewegingen etc. En niet ieder kind is blind, een visuele beperking kan op veel verschillende manier zijn

- Professional 3: Ik denk dat dit zeker mogelijk is. Bij slechtziende kinderen kan er rekening worden gehouden met de kijkafstand, dus bv je eigen gezicht dicht bij het kind houden. Je kunt ook in de keuze van het materiaal hier rekening mee houden, zoals gebruik van groot materiaal, duidelijke kleuren, niet teveel details. Bij blinde kinderen is bij het spiegelen belangrijk dat het kind je beweging kan voelen of het geluid kan nadoen.

Welke manier van spiegelen zou het meest effectief zijn voor kinderen met een visuele beperking?
3 reacties

- Professional 1: verbaal is een belangrijke ingang maar ook meebewegen

- Professional 2: is voor mij helemaal afhankelijk van het kind, Je gaat kijken en probeert aan te sluiten bij hoe het kind reageert. Dat kan zijn door bewegingen na te doen, door te praten, of combinaties van verschillende methodes.
  Het belangrijkste: kijk hoe het kind reageert!

- Professional 2: Blinde kinderen: bewegingen laten voelen, geluid maken/praten. Voor slechtziende kinderen ook imiteren op grond van datgene wat ze zien. Hierbij gezichtsmimiek dichtbij brengen, grote materialen gebruiken in duidelijke kleuren.

# APPENDIX F: USER TEST 1

## APPENDIX $F_1$: APPROACH

User: A boy of three years old
Both a parent and outpatient counselor are present, as well as two of our project group

GOAL
Discover if any form of bonding occurs: mirroring, joint attention, touch/ close contact, play-development and any form of interaction between parent and child. We also would like to observe how a normal session with the outpatient counselor goes, without our design. Thereby we want to focus on several other aspects, regarding the usability of our design:

- Easy to use for parent and visually impaired child
- Understandable for parent and visually impaired child
- Are they encouraged to use our design?
- How long is the attention of the visually impaired child kept?
- Is the visually impaired child not overstimulated?
- Is the visually impaired child stimulated to move?
- Does the visually impaired child interact with all the aspects of our design (are they playful enough)?
    - Ears
    - Whiskers

- Button
- Tale
- Doorbell
- Doors
- Window
- Light

APPROACH
First, we have to introduce ourselves to both the parent and the visually impaired child. We have to make a good impression from the beginning, so that the parent and visually impaired child do not feel awkward around us. The parent has to sign the consent form (see appendix F3 *Consent form*), after we explained our concept once again. After that the camera needs to be installed in such a place that the whole playing environment can be filmed. As an outpatient counselor will be present too, we will observe how she normally starts her session with the visually impaired child. After a while, our design will be introduced to the visually impaired child by the parent or counselor. The visually impaired child and parent or counselor are left to play with our design. We did tried to play with the visually impaired child ourselves, to experience the interaction. However, we will take additional notes, using pen and paper, especially focused on bonding. After the playing session with the visually impaired child, depending on his/her own concentration and interest, we will conduct a small interview with the parent and counselor about our design.

## APPENDIX $F_2$: ANALYZATION
In order to analyze the videos that were made during our first user test, we made themes which we wanted to focus on. According to those themes, observations were conducted.

USE OF BUTTONS
Number of time that the sound was activated by child: 48 times in approximately 1.5 hour
*This indicates that the child has interests in the sound and buttons.*

Number of time that the light was switched on and off by the child: 40 times in approximately 0.5 hour
*This indicates that the child has interests in the light. As the switch was difficult to use, the child might would have turned on the light more often. If the light would have had the same button as the sound, we predict that it would have been switched on and off more often.*

Number of times that the ears were pulled off: 3 times in approximately
*The child first showed that he did not understood that the ears could be pulled off. But he repeated this behavior also, so there might be a learning curve.*

REACTIONS
Sound: “Hè?” “Poes!” [ Hé? Cat! ] A lot of laughter.
*The cat is recognizable according to the sound. The visually impaired child is pleased to see the cat.*

Ears: “Ik ook een oor” [ I want an ear too ]
*The visually impaired child indicates that he wants to mirror his parent*

“Oor hoort niet in huisje” [ the ear does not belong in the house ]
*The visually impaired child has difficulties with connecting the ear to the house*

00169; 05:16 → Moving the cat, by bouncing and shuffling it.
*Fantasy occurs*

SUGGESTIONS
“Handpoppen” [ hand puppets ]
*Could be a suggestion for the booklet*

Light out, cat goes to sleep: “Slaap poesje slaap” [ lullaby for the cat ]

Child fantasizes about cat, suggestions for the booklet

Tickling each other with ears, to stimulate bonding
*Might be a nice suggestion, to put in the booklet.*

The outpatient counselor said that simple designs encourage fantasy play
*This might be something to consider/maintain*

Repetition is fun
*This was a result of both our research as the user test*

''Doe de snorharen maar in een leuke vorm'' [ Can you put the whiskers in a nice shape? ]
*Suggestion for the booklet*

The outpatient counselor talked every step through ''know I will close the door also'', this way the child hears that she is doing the same.
*Suggestion to mention in the booklet*

The counselor tried to mirror every action of the visually impaired child
*Suggestion to mention in the booklet, parents should do this too*

The counselor first showed the visually impaired child how to do something when he seemed not interested enough. Doing it together worked really well for this visually impaired child.
*Suggestion to mention in the booklet, parents should do this too*

Look at the same time through the door and window to see each other
*Suggestion to mention in the booklet, parents should do this too*

First do it together then let the child do it him/herself.
*Suggestion to mention in the booklet, parents should do this too*

MIRRORING/ JOINT ATTENTION

- 00168; 03:36 → They both look at the house at the same time ''shall we ring the bell together?''
- 00168; 08:00 → They both look through the door and window at each other, at the same time.
- 00168;10:10 → They both close the door of the house, and Minette names it as she does it.
- 00168; 10:26 → Minette (outpatient counselor) does the same as the child ''First know on the door and then open it''.
- 00168; 11:52 → They look both through the window of the house at the same time.
- 00168; 12:13 → They both close the door of the house, ''I will also close the door now''.
- 00169; 03:59 → First Veerle pulls off the ear and afterwards the child pulls it off.
- 171; 01:44 → First Minette does her hand in the ear, and then the visual impaired child does the same as her, so they have their hands in there together (mirroring).
- 172; 00:21 → First Minette tickles the visual impaired child, and then he does the same with her.
- 173; 01:59 → The visually impaired child mirrors the surprise reflex of Minette.
- 173; 09:22 → They slam on the door together.
- 174; 00:54 → They throw pens in together.

*As can be seen from these notes, a lot of mirroring occurred during the test. Among which the mirroring of the facial expression of the counselor. This could be explained by the close contact between counselor and the visually impaired child. Not only mirrors the visually impaired child with the counselor, also with Veerle, someone he has not seen before. We were impressed with the many possibilities to mirror, like looking through the windows at the same time, that we had not foreseen.*

TOUCHING

- 00166; 01:22 → The mom touches the visual impaired child as she talks to him and he reacts to that by talking back.
- 00168; 01:27 → The visual impaired child looks at Minette and laughs when he likes something. She touches his hands when putting down the pot. Afterwards he can do it himself without the touch of Minette.
- 00172; 02:05 → They first do the lights on and off together, then he can do it himself.
- 00172; 02:57 → Minette touches the visual impaired child to get his attention, only when he is distracted.

*They do not touch each other much, only when necessary. This might be the case, because the visual impaired child is out of the explorative phase (see chapter 1 Introduction). He wants to try out things on his own, and the parent or caregiver needs to respect that. Therefore, they might touch each other less often than expected.*

FEEDBACK FROM THE VISUAL IMPAIRED CHILD

- 00168; 02:42 → The visual impaired child makes the same sentences as Minette and does as her when rolling the ball, after she did it before him.
- 00168; 03:45 → Looks at Minette when he discovers something new, also answers her questions.
- 00168; 11:29 → ''Do you hear it too?'' asks the visual impaired child
- 00168; 12:19 → Laughing because of the boom-sound of Minette.
- 00168; 07:01 → Laughing (happens around the 10 times)

*This visual impaired child gives a lot of feedback, by talking and laughing. This is nice, as they auditive mirror each other also.*

DID NOT EXPECT

The visual impaired child gives a lot of feedback, by talking, laughing and looking at the one he is playing with. He actually tries to turn his head in the right direction. He also mirrors a lot if someone first tries it before him. The mother is tempted to touch the visual impaired child more than the outpatient counselor is. There are quite some times that they do mirror at the same time (surprise reaction/ hands in ears of the cat). The visual impaired child was able to use his imagination very well, which gave us some possibilities for improvement. For example, he wanted to put the tail in the house as well, so it might be useful to make the tail removable too.

DID EXPECT

There are a lot of possibilities for mirroring, but it mostly happens by doing it after each other, instead of the same time (throwing pens in/ making the same sentences). Thereby, some really good suggestions for the booklet appeared, because of the experience of Minette (the outpatient counselor). This way, parents can have a guideline for playing with their child.

DID EXPECT BUT DID NOT SEE

The visual impaired child was more interested in the house than in the cat. He did not spend that much time exploring the objects, but mostly on pressing buttons and in-out play.

# APPENDIX G: USER TEST 2

## APPENDIX $G_1$: GOAL, APPROACH & CHANGES

For this user test with the second participant (15 months old) the goal and approach remains the same. As an outpatient counselor will be present again, we will also again observe how she normally starts her session with the visually impaired child. However, this time we would as well like to test whether the changes in concept and realization have the intended effect. Changes that we wanted to test are:

- Added auditory features (bells) to the tactile enlarged parts of the cat, mostly the tale to make it more interesting
- The tale of the cat which can now be loosened

- The opposite sides of the house having the same bright color
- Added light to function as a mirroring tool on the house which can be operated by the parent and the child

Hereby the focus is on bonding, keeping interest and usability.

## APPENDIX $G_2$: OBSERVATIONS

MIRRORING

- The mirroring is hard because she does not exactly know what is happening on the other side of the house (on which the parent is located)
    Suggestions:
    - Make two doors and two windows on each side of the house
    - Make the light strip go over the house
    - Make each cat sound “miauw” linked to the buttons equally loud on each side of the house
- It is possible to mirror with the 2 light strips

CAT

- The cat is funny for visually impaired children younger than 1 year old
- Mila puts the tail around her neck and she likes shaking the tail which makes the bells ring
    Suggestions:
    - Add another tail to the cat for mirroring
- Especially the nose of the cat is interesting, the whiskers of the cat not so much

- Make whiskers more interesting
    Suggestions:
    - Add bells to the whiskers which makes the ends less sharp as well
    - Or add shrink sleeves at the end of the whiskers to make the ends less sharp
- Make ears more exciting
    Suggestions:
    - Add foil which you put flowers in which is reflective
- Children love reflection
    Suggestions:
    - Add little mirrors on the cat
- The cat needs to be washable
    Suggestions:
    - Go to a play store for inspiration (Intertoys, Bart Smit)

HOUSE

- Make the roof fixed, since the child will find out that it can be taken off
- The corners of the house are too sharp
    Suggestions:
    - Cover sharp corners with soft material
- The base mat prevents the house from making scratches on the ground
- The house should be of a smaller size to make sure smaller visually impaired children can notice what happens on the opposite side of the house

BOOKLET

- Let the visually impaired children first find out and then use the stories in the booklet

BUTTONS

- It is too hard for a visually impaired child of this age (15 months) to keep the button pressed to continue to hear the whole sound of the doorbell
- It takes too much time before the “miauw” sound starts
- Put the speaker near the button since especially visually impaired children go after the sound
- Sounds are the most interesting as feedback from actions
- Buttons are really fun to play with, it is the first thing she keeps reaching at
- Loops for opening the doors are a useful addition compared to the previous iteration

VISUALLY IMPAIRED CHILD

- She is very light oriented
- Behavior varies per month especially for children in the age range of our target group from 6 months to 3 years old
- When they are around half a year they have the urge to put everything in their mouth, which is in their exploring phase
- Simple is better. E.g. She can entertain herself all day with a ribbon, but she never plays with her fisher price hotel
- Auditory feedback from the 15-months-old visually impaired child is little
- She does give feedback through laughing and saying ‘’no’’
- Sounds emerges attention, mostly the sound of things different from voice

DID EXPECT

We expected the second visually impaired child (15 months old) to perform several bonding activities as mirroring with time difference by using the button; putting features of the cat into the house and getting them out. This was also seen when observing her.

DID NOT EXPECT

We did not expect her to hold the buttons for a very short period of time compared to the child in the first user test. Namely, she was not able to hold them as long as the duration of the “miauw” sound because of a low muscle strength due to her age.
Moreover, we did not expect her to be as excited by the tale of the cat as she was. She started giggling out loud when her father shook it right in front of her. This gave us the inspiration to make another tale to function as mirroring feature as well.

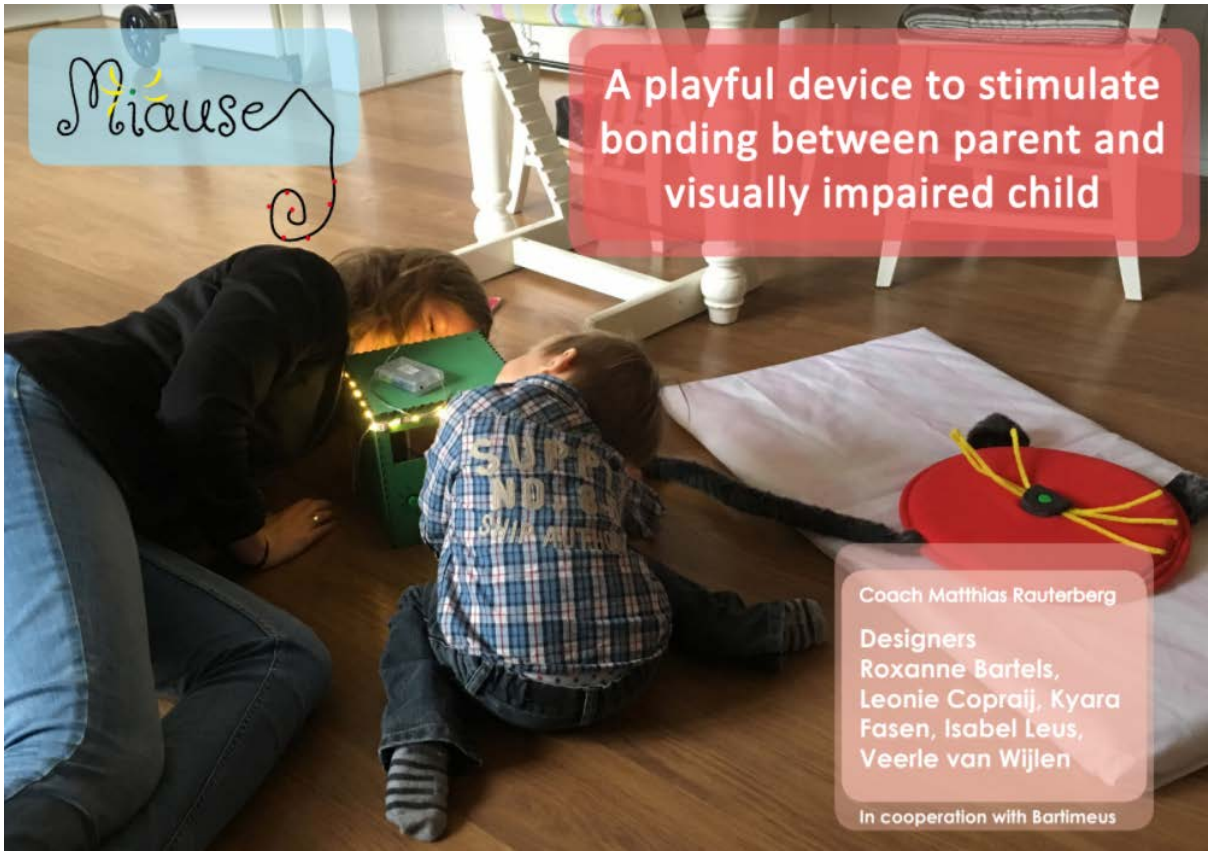
DID EXPECT BUT DID NOT SEE

We expected the second visually impaired child (15 months old) to have more interest for the cat instead of the house because she was way younger than the first participant, who liked the house better. However, the second child did not show to be more interested in the cat. Instead she interacted more with the house and some parts of the cat, as its tale and ears.
We also expected from the results of the first user test that the child would create a story around the cat and house while playing with both but this did not happen. Probably, because she had not reached the fantasy phase in play-development yet.

## APPENDIX H: FINAL DEMO DAY PRESENTABLE

### APPENDIX $H_1$: FLYER


### APPENDIX $H_2$: POSTERS




*B2/ DP / Physical and Social Rehabilitation*
***Miause***

SCAN FOR EXPLANATORY FILES

# Miause

Bonding between parents and their visually impaired child is very important to decrease stress and to stimulate brain development. However, this is hard due to lack of sight. In cooperation with Bartimeus (institute for visually impaired and blind people) we designed Miause, a playful tool that tackles this problem. Our design consists of three elements, a booklet, a cat and a house. Together they contain several aspects that encourage mirroring, joint attention and multisensory stimulation which are key elements to facilitate bonding. Thereby, we tried to make our design interesting for the children, by making use of bright colors and many possibilities for exploration. The cat (6 months-1y/o) is mostly stimulates joint attention, jointly feeling the cat with its ears and whiskers. The house (1-3 y/o) is mostly encourages mirroring, opening the doors at the same time, imitation of sound and simultaneously turning on the lights. The booklet is a guideline for parents containing a story together with play suggestions to facilitate bonding and to build a bridge between the cat and the house.

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**Project Coach:** G.W.M. Rauterberg (Matthias)

**Expert(s):** Minette Roza **Client:** Bartimeus (P. S. Sterkenburg)


Process
Difficulties in bonding between child with visual impairment and parents.
How can we design playful objects that stimulate bonding between child with visual impairment and parents?
Research
Ideation
Realization
Validation
Validation
Valiation