



everybody dance

Enhancing the music festival experience for hearing-impaired people.

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EXECUTIVE SUMMARY

This thesis describes the design process to enhance the music festival experience for hearing-impaired people. This assignment was set up to make the MOJO backstage exhibition at Museum Prinsenhof Delft inclusive for hearing-impaired people.

First, context mapping research with hearing-impaired and hearing festival visitors shows that inclusiveness at festivals is less present for hearing-impaired. To include hearing-impaired, the focus is to minimize the language barrier and create an independent and equal interaction.

Combining the mapping information with desktop research and a sensitizing experiment, resulted

in socio-cultural dimension diagrams (Hofstede, 2018) which compare hearing and deaf cultures. Differences conclude that deaf culture is more together, emotionally expressive and contextual.

With music experience being one of the main reasons for people to visit festivals, for hearing impaired this is experienced through vibrations, live performances and dancing audiences during a music festival.

In current products and theories music characteristics are often literally translated to structures of the tactile and/or visual sense, because they are capable to change over time and have a wide variety. Unfortunately, most of these abstract theories and

products are not able to convey the same emotional response as people who hear songs via sound.

Therefore, a test with hearing people was performed to find similarities in emotional response to music of hearing and hearing-impaired people. Hearing people were asked to elaborate on Justlin and Vastfall's (2008) emotional responses to music. Similarities between the answers given in this test and interviews with hearing-impaired, were found within two of the categories; emotional contagion and rhythmic entrainment.

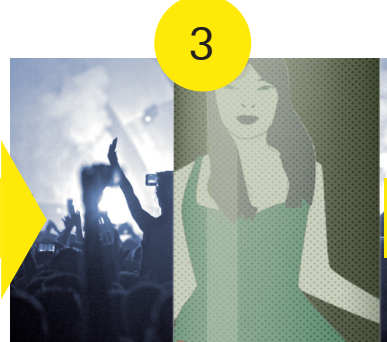
During interviews and observations at several festivals, using current solutions like the Lofelt



Person 1 is the chosen dancer from the crowd. He/She is chosen because of clear and easy to imitate dance moves.



Person 1 is chosen by a special camera man, that films his/her dance performance.



The dance is digitally transferred into a digital character which is shown at a different spot in the crowd.



People around the character can 'play' by mimicking the character. As a reward they will get visual and haptic feedback.



This active interaction will stimulate everybody around the players to dance more active.

bracelet and sign dance shows. It was discovered that rhythmic entrainment is experienced by hearing-impaired people by feeling bass through vibrations of speakers or floors. Emotional contagion is experienced by dance moves and facial expression of a crowd or performers on stage.

The goal of this study is to design a product that uses visual dance and vibrations of the bass as means to create an inclusive interaction between hearing-impaired and hearing festival visitors. This is done by an interactive dance game that is played during a live concert. (fig 1) The game is played by mimicking dance moves on the beat, while the beat is felt by vibrations of the bass. (fig 2)

A concept test concluded that the game is inclusive because it was played just as well by hearing as hearing-impaired people. Also, bystanders joined the dance game without being an actual participant. This effect is expected to be even bigger in the festival context. Hearing-impaired

people mention to feel more independent and confident at a festival when using a product like this. It would be interesting to develop a portable (smartphone) version to be independent of a location. Further research could be done to develop the character into a fully automated (sign) dance character which would make hearing-impaired fully independent of their peers at every location in time.

To implement this concept into the exhibition at museum Prinsenhof, the haptic feedback tool used during the game (a bracelet) will be used during the entire exhibition to involve hearing-impaired people with surrounding sound. This will vibrate wherever there is sound (bass) surrounding the visitor. This vibration will increase and decrease whenever the sound becomes louder or softer. Louder vibrations will attract hearing-impaired visitors to designed places in the exhibition where they can get more explanation about current innovation in the field of music for hearing impaired.



Fig 2. Render of final concept, 'Everybody dance'.



Fig 3. Drawing of a figurative deaf festival goer.

Jij hoort een baby huilen,
ik zie zijn tranen zijn gezicht nat maken.
Jij hoort het zingen van de vogel,
ik zie haar bekje vrolijk bewegen.
Jij hoort de wind blazen,
ik voel hem op mijn gezicht.
Jij hoort het razen van de donder,
ik zie de lucht zwart en dreigend.
Jij hoort het zoemen van de auto,
ik zie en voel hem krachtig voorbij rijden.
Jij hoort het tikken van de klok,
ik zie de wijzers langzaam voortbewegen.
Jij hoort mijn stem,
ik lees je lippen en zie de taal uit je lichaam.

Jij hoort, jij luistert naar mijn woorden
Ik hoor jou niet, maar ik lees de jouwe op je gezicht.
Ondanks het verschil heb ik toch ander geluk,
Omdat ik mezelf kan zijn.

- Maria

TABLE OF CONTENTS

CONTENT

1.0	Introduction	
	1.1 Assignment	Pag 12
	1.2 Partners	Pag 14
	1.3 Method	Pag 18

ANALYSIS

2.0	Target group	
	2.1 Hearing-impaired culture vs Hearing culture	Pag 22
	2.2 Cultural dimensions	Pag 26
	2.3 Personas	Pag 28
3.0	Context	
	3.1 Mainstream festival vs Festival inspired by deaf people	Pag 30
	3.2 Market analysis	Pag 32
4.0	Music as a structure	
	4.1 Visual and Tactile	Pag 34
	4.2 Music and Emotion	Pag 36
	4.3 Rhythm	Pag 38

DEFINE

5.0	Framing direction	
	5.1 Scope	Pag 42
	5.2 Guidelines	Pag 44
	5.3 Solution space	Pag 45

DEVELOP

6.0	Concept development	
	6.1 Concept directions	Pag 48
	6.2 Concept selection	Pag 50

EVALUATE

7.0	Final concept	
	7.1 Concept explanation	Pag 54
	7.2 Scenario	Pag 56
	7.3 Feasibility	Pag 57
	7.4 Final interaction test	Pag 58
	7.5 Conclusion	Pag 60
	7.6 Expert evaluation	Pag 63
	7.7 Recommendations	Pag 63

2ND LAYER

8.0	Museum Exhibition	
	8.1 Define	Pag 66
	8.2 Develop	Pag 68
	8.3 Deliver	Pag 69
	8.4 Feasibility	Pag 71

ADDITIONAL INFO

9.0	Reflection	Pag 74
10.0	References	Pag 76
11.0	Appendix	Pag 78

COI

This chapter defines the original assignment and the most important partners involved and their stakes in the project. The method that is used during this project is also discussed.

INTENT

1.0 INTRODUCTION

This chapter contains the original assignment of this thesis, including the problem analysis, the design goal and the research questions. The chapter also describes the values of the involved stakeholder companies as well as an explanation of the design methods that are used to conclude the results from this thesis.

1.1 Assignment

This assignment was set up by me to make the MOJO backstage exhibition at Museum Prinsenhof Delft, inclusive for hearing-impaired people.

1.1.1. Problem analysis

Museum Prinsenhof plans to organize an exhibition about MOJO and their innovative culture. Therefore, they asked nine IDE TU Delft students to come up with the newest innovative ideas in the context of MOJO. The outcome of this research will be shown in their exhibition. One of the innovative ideas was an inclusive festival experience that would, for example, provide hearing impaired with access to the full MOJO festival experience.

The outcome of this research is valuable for the integration of deaf people in society as well as enhancing the festival experience for all visitors.

The festival culture is currently a big social trend that connects individuals in an interesting way. Previous research suggests that engagement with music in a festival context can contribute to the creation of a sense of community, binding group members together as participants in a larger culture and providing an opportunity to engage in social activities (Frith, 1996; Gibson & Connell, 2005). A big player in the field of music festivals and concerts is MOJO who is always looking for new innovations and ways to share their love for music with as many people as possible.

In the Netherlands there are 1.3 million people who are deaf or hearing-impaired. Due to a decrease in abilities to communicate with others, hearing-impaired individuals can experience social isolation (Crews & Campbell, 2004), depression (Roth, et al., 2011), and even early death (Stephoe, et al., 2013).

In theory music can be used as a means to communicate between individuals instead of language (Cross, I., 2014). Because music is more than sound connected to one specific meaning, like speech, the inherent meaning of music can be

transferred in another way than only sound. Therefore, deaf people might understand the message easier, which could break the communication barrier between deaf and hearing people and make deaf people less isolated.

Currently there is a lot of interesting research in the field of multisensory design (Karam, et al., 2010). This gives a lot of insights in possible solutions for deaf people to perceive music. Although there are some products that make it possible for hearing-impaired to enjoy (a part of) music, like Lofelt or the emoti-chair, these do not yet create social engagement like music festivals. The full music festival experience is mainly caused by the music experience, festive experience, social experience and separation experience (Packer, J., & Ballantyne, J., 2011).

1.1.2. Design goal

From this problem analysis about the strengths and weaknesses of the biggest stakeholders involved in this project, the original design goal was formulated. Reaching this design goal will contribute to the involvement of deaf people in society by using the context of (music) festivals.

Design a product or service for hearing-impaired people to get a better understanding of music experience at a music festival. This product needs to strengthen the festival experience by enhancing a feeling of togetherness with other festival visitors.



Fig 4. Two people interacting without spoken language while listening to music at a silent disco.

1.2 Partners

This assignment is created together with Museum Prinsenhof to show the success story of MOJO and to demonstrate future possibilities for festivals and concerts, since MOJO has always been an innovative company. The assignment is not only created with the context of festivals in mind, but it also needs to succeed within the context of this museum exhibition. Because of this complicated double layered context, both partners are researched to create understanding of both parties to start the design process.

1.2.1. Museum Prinsenhof Delft

To stir the museum in a new direction and attract a wider audience, museum Prinsenhof Delft decided to invest in an exhibition about modern success stories from Delft. One of these best success stories is MOJO, the biggest organization of concerts and festivals within the Netherlands.

MOJO backstage exhibition

Museum Prinsenhof Delft is presenting MOJO backstage in 2019. With this exhibition the museum celebrates the 50th birthday of an important organization from Delft, MOJO. Driven by his passion for music, Berry Visser starts a company in 1968 that grows out to become the biggest music promoter of the Netherlands. The first stadium concert of Bob Dylan, the first weekend festival in the Kralingse Bos, special concert halls, innovative fences and festival tents that look like cathedrals; MOJO thought of it.



Fig 5. model of the MOJO backstage exhibition in Museum Prinsenhof Delft by Peter te Bos.

MOJO is the foundation of the pop music culture in the Netherlands. In the same line as the other Delft Masters, the story of MOJO will be showed in an innovative way. Next to festival objects, the festival experience is a focus of this exhibition as well. Visitors will feel like the artist and the public and experience the sensation of music. The museum is partnering with Peter te Bos and TU Delft students. TU Delft students are involved to create the new and more future orientated museum image that Museum Prinsenhof wants to express. The entire museum will be one big festival experience; the Sint Agathaplein will be the festival terrain, the museum basement will become a rock café and the Prinsentuin will be converted into a music hero graveyard.

With Mojo Backstage, Museum Prinsenhof Delft will attract new audiences like music lovers, pop- and jazzconcert visitors and especially youth. In addition, an innovative program for hearing-impaired people will be designed. Thereby, the museum will show that they are in the middle of society.

Waalde kerk (Peter te Bos)

Together with Museum Prinsenhof Delft, it was decided to create a second layer within the museum, dedicated to deaf people. This layer should be an experience for deaf people, but also for interested hearing museum visitors. However, not all museum visitors are interested in this second layer. Therefore, it has to be possible to ignore the second layer in the museum. The extra layer will mainly show existing solutions for deaf people and will end with a future view, designed within this project.

All visitors will end their route of the exhibition in the Waalde kerk. In consultation with Museum Prinsenhof Delft and the main designer of the exhibition, Peter te Bos, it was decided that this church would be a suitable place to show the future perspective on festivals for deaf people, with respect to the route and the original purpose of the room.

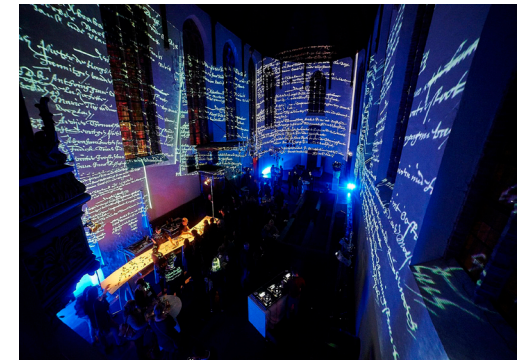


Fig 6. Collage of the Waalse kerk design for the MOJO backstage exhibition by Peter te Bos.



Fig 7. Crowd at Down the Rabbit hole festival. .

“The euphoric feeling that music brings, you can find back in the name MOJO, a constriction of Motivation and Joy.”

- Prinsenhof museum

1.2.2 MOJO concerts

Mojo created a pop music festival culture in the Netherlands, which is based on being free from inhibition, creating a community feeling and visitors being entertained at all time (Zubech, 2014). When visiting a festival visitors mention to feel curious and active at all times. They want to interact, learn, have fun and play as much as possible. (Chapter 3.1)

This culture opens up an opportunity for deaf and hearing people to get in contact with society, as is already shown in festivals like Sencity and Mutesounds. Although the big size of a company like MOJO can have great impact on society, MOJO does experience difficulties making their festival inclusive for deaf people, by for example limited contact with sign dancers. This is mainly the result of their organization, as every decision needs to be grounded when organizing such big events. Therefore, there is no space for fast changes without testing them in detail. Another important value of

MOJO is their focus on the artist. They serve the artist and this means Mojo does not always know what is going to happen during the show, their job is to make everything possible. Unfortunately, this makes it difficult for ‘translating media’, as they need to be generated spontaneously.

Since one of the groundings of MOJO is to provide the best music experience for everybody, it is important to them to also include deaf people. However, quality for every festival visitor and the artist cannot decrease and is the focus of every decision. To be able to design a successful product for MOJO, which makes their festivals more accessible for deaf people, this conflict needs to be solved.

“It would be amazing if you could help to make events from big organisations like MOJO more accesible”

-Jessica van der Waard (Hearing-impaired, founder of foundation muziektolkhoorterbij)

Visit Madame de Berry museum

According to field research the Madame de Berry museum provides a look into the brain of the founder of MOJO, Berry Visser. Madame de Berry is a museum in Delft, where the visitors are led through a dreamy experience by audio stories, a tour guide, moving objects and a surprise show.

This dreamy feeling of being in another world is something that is strongly represented in MOJO festivals and something that makes them unique compared to other festival organizations.

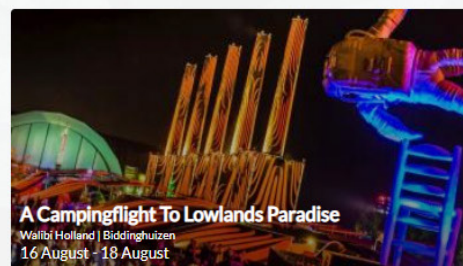
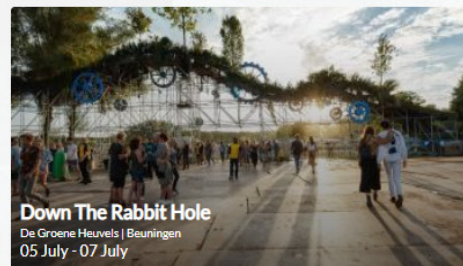
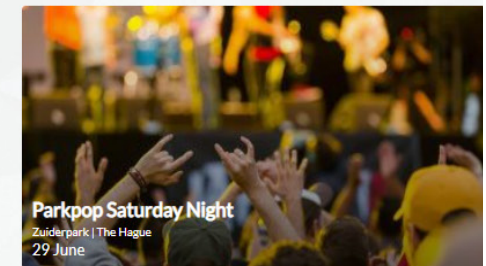
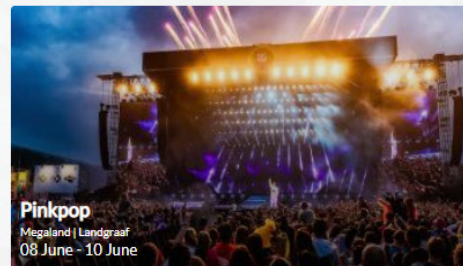
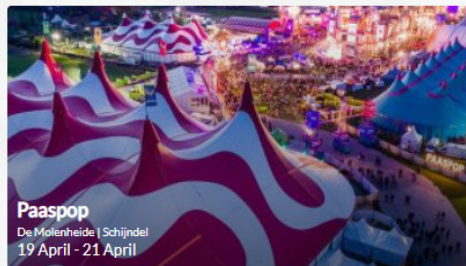
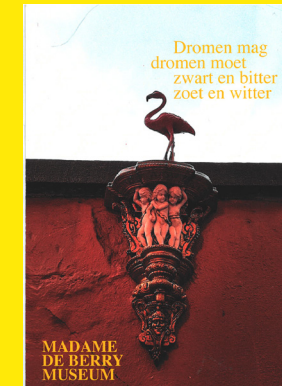


Fig 8. The 10 biggest festivals organized by MOJO.

1.3 Method

The project is user research focused, by putting emphasis on stakeholder research, interaction prototyping and testing. Nevertheless, all cycles of a basic design approach will be touched. The project starts with a general market research and stakeholder analysis.

The market research will be done by desk research, observations in the field and by talking to experts. The stakeholder analysis mainly focus edon qualitative research of the main stakeholders by interviews and context mapping. Since having stakeholders with different cultures needs more empathizing, additional literature research and observations are done. For this specific stakeholder a method like interviewing was adjusted to a more suiting way of interaction, in this case context mapping. Context mapping was chosen because it is a more visual and storytelling method, which are both strongly represented in deaf culture. Other stakeholders like MOJO and Museum Prinsenhof are interviewed, in which they were able to express their knowledge, values and worries. Insights from all stakeholders and technology research is gathered and written into statements. These statements are clustered to get an overview of all the research and structure the results. Conflicts where found between the values of different stakeholders and/or the possibilities of technology. These conflicts resulted in a design

goal and an interaction vision. The design goal was the start of a brainstorming phase, where How to's, Brainwriting and Synectic's are used in groups as well as alone. These brainstorms have resulted in ideas that are tested within short sprints by roleplaying and interaction prototypes which are tested within the context together with the target groups. Every interaction prototype is evaluated and redesigned until the desired interaction was achieved. Subsequently, the design is further detailed and recommendations are formulated to realize a marketable product.

Meanwhile a second design sprint is done, incorporating all research. This second design sprint results in a concept idea that merges the final design for festivals into the context of the museum exhibition.

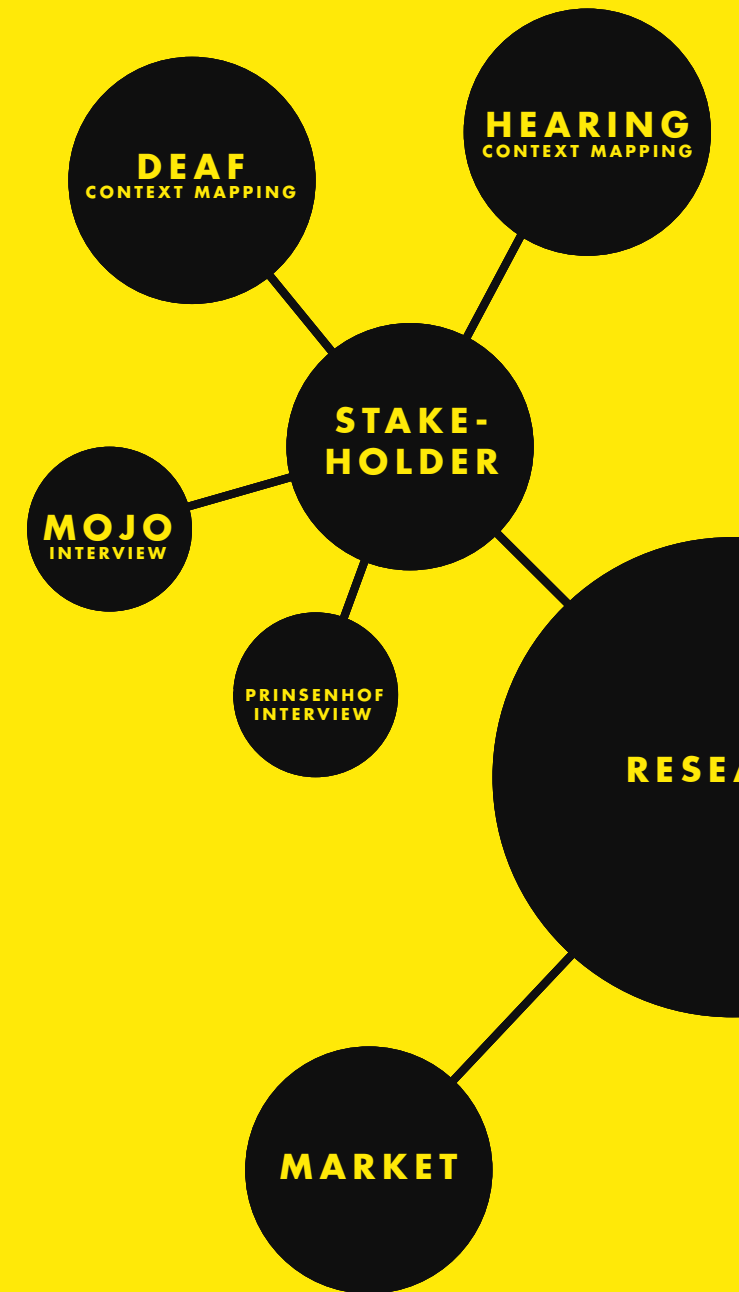
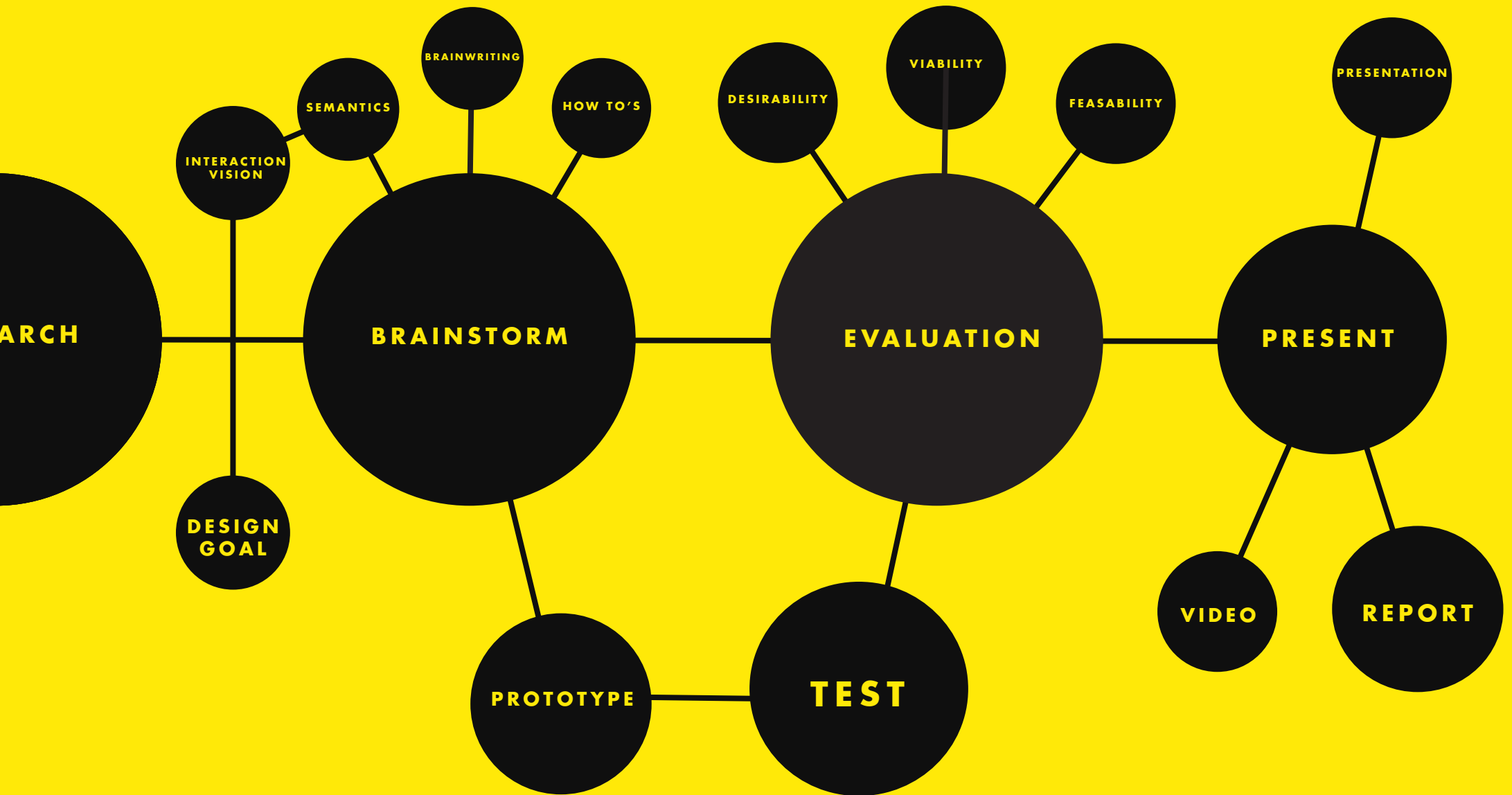


Fig 9. Visual of design method used in this thesis.



ANN

This chapter includes a study into the target groups and their cultural differences, a context analysis about festival culture and a detailed analysis about music as a system.

ANALYSIS

2.0 TARGET GROUP

Since deaf people have their own culture, socio-cultural dimensions are created to make the differences visible. These socio-cultural dimensions are created according to insights gathered from a context mapping session with deaf and hearing festival visitors, interviews with deaf people and desk research.

2.1 Hearing-impaired culture vs Hearing culture

Method

To capture the differences of deaf and hearing Dutch culture, with a focus on music, a context mapping session was conducted. The path of expression was used as a basis of the session, to gather deep insights from the participants. (Fig 13) The participants were asked to bring cultural probes with them to get sensitized with the subject before starting the session. When the participants entered the session they were asked to capture their thoughts on an A3 paper. Materials they could use to capture their thoughts were pens/ colors/ stickers and pictures of random stimuli. These pictures were also used to stimulate the thoughts of the participants into memories they didn't think of before. After having a short talk about the current experience of the participant with music (festivals) the cultural probes were used to reflect on past experiences. These experiences from the past gives them new insights into the current experience, which provides the participants with inspiration about a possible future experience. (Sanders & Stappers, 2012)

Participants

Initially two participants were asked to join the context mapping session. During the session the sign interpreter also joined the session, as she did sign dancing for deaf people at concerts and could therefore bring interesting results, for example about the relationship between sign dancers and big festival organisations like MOJO.

- 1) Maria, a 42 year old woman who has been deaf from birth and got interested in music by dancing classes.
- 2) Maartje, a spontaneous 23 year old festival and museum visitor who is interested in other cultures.
- 3) Clarissa, a 22 year old sign interpreter, who has been in a deaf choir and does sign interpretations at concerts. She also likes to visit concerts with her hearing friends.



Fig 10. Cultural probes brought by Maria during the session.

“If I would know beforehand a person was deaf I wouldn’t get in contact. Although if it happened by accident I would be very interested.”

-Maartje



Fig 11. Maartje during the context mapping session.

Results

The maps made during the context mapping session show the insights which the participant thought where most interesting and meaningful to them. (Fig. 13) From the interview, several conclusions can be drawn (Appendix A, context mapping session)

Hearing festival visitor (Maartje)

Maartje talks about the open vibe she often experiences and the crowds that Clarissa mentioned as well. These conditions could bring her into contact with deaf people, but she would not just talk to them. Maartje would be afraid, because she does not know a word of sign language and she

feels obligatory to know this if she starts talking. When she would get into contact with a deaf person by accident, she would get her phone out and type on her notes, because she is very interested in new cultures and experiences. Maartje hopes that there will be more technology used in the future to stimulate all senses, but at the same time she wants



**"I have seen music bringing all different people together."
-Clarissa**

**"It is difficult when several groups do different movement. I have no idea wherel should look"
-Maria**

Fig 12. Maria and Clarissa during the context mapping session.

Hearing aids/ cochlear implant* and their music reproduction

Most people who are hearing-impaired use a tool to reproduce the sound surrounding them. This results in a big spectrum of sound and the ability to experience music. However, most users of hearing aids and cochlear implants do not enjoy the

musical reproduction via their tool. (Bader, 2018) This was confirmed by the context mapping session with Maria, who explained that she likes to turn off her CI to focus more on the visual and/or tactile experience of music.

“Ik do hear music with my CI, but I have no idea if it is nice. Through your signs I do know.”

-Maria

* A cochlear implant is an electronic medical device that does the work of damaged parts of the inner ear (cochlea) to provide

to be in nature and be free during a music festival.

Sign language Interpreter (Clarissa)

According to Clarissa all kinds of people can come together through music at a festival like Sencity for example. She also talks about long waiting lines and the fact that more people are wearing earplugs nowadays. As a sign dancer she hopes that sign interpreters can work more closely with big festival organization, so they can interpret the lyrics of the music to deaf people during concerts which makes festivals and concerts more accessible for deaf



Fig 13. Final context mapping sheet of Maria.

Deaf festival visitor (Maria)

Rhythm comes from within a human and can also be experienced by deaf people. If Maria looks at a dance teacher once, she can follow the rhythm better than some hearing students.

The cochlear implant (CI) enables Maria to hear ‘music’, but she cannot understand the lyrics or the beat. When Clarissa (sign interpreter) starts sign dancing, she immediately follows the rhythm and mentions she feels the emotion.

Maria also gave me a powerful poem which explains the differences between being deaf and hearing, that can be found on page 7 of this thesis.

Conclusion

This context mapping session with hearing-impaired and hearing festival visitors show that inclusiveness at festivals is less present for hearing-impaired, because they are misunderstood, and less interactions are experienced because of the language barrier. Furthermore, hearing-impaired often feel dependent of their peers when talking to hearing people, which makes them less eager to get involved. When deaf music experience was mentioned Maria talked about dance and vibrations in floors or balloons. She stated that this input needs to be given within a clear structure so she could find the rhythm within herself.

2.2 Cultural dimensions

From the context mapping sessions, sensitizing experience (Appendix B) and desk research several differences were found between Dutch deaf and Dutch hearing culture. These differences and similarities are visualized in socio-cultural dimension diagrams. (Boeijsen, 2013) Differences and similarities in culture are important to take into account when designing for behavioral change of two different cultures together. For example time, space and attitude are very important when people want to dance together, while respecting eachothers culture. The visualizations on the righth are a general image of people within this cultural group, so average differences can be compared. However, of course every individual is unique and in this case it is important to state that there is a big variability within the group, as some people were born deaf, others became deaf later in life and some are hearing-impaired but can still hear some sounds. These differences influence the culture a person ends up in, for example because of a different education or upbringing.

From the context mapping several conclusions can be drawn regarding the differences between Dutch deaf and hearing culture. The biggest socio-

cultural differences can be found in the categories: identification, expression and truth. Additionally, small differences were identified, for example in space, which is a purely practical outcome due to attention grabbing via touch instead of sound. Also the differences in truth and expression are a practical outcome for people who speak in sign language, because sign language has simpler grammar and is much more direct. (de Ronde, 2017) An interesting fact that was also observed but not expected, was the extensive ex-planation of for example stories deaf people tell. The bigger socio-cultural differences on the other hand, are also due to nurture of the environment and can differ a lot from one person to another. While one deaf person can be very proud of their community and sees several benefits of being deaf, another one, who became deaf later in life, might still be struggling with his or her identity. (Ursinus, 2007)

“My ears are not broken, I am a visually formed person”

-Ellen Nauta, gast at ‘de Balie’ during the premiere of ‘Doof Kind’

DUTCH HEARING SOCIO-CULTURAL DIMENSIONS

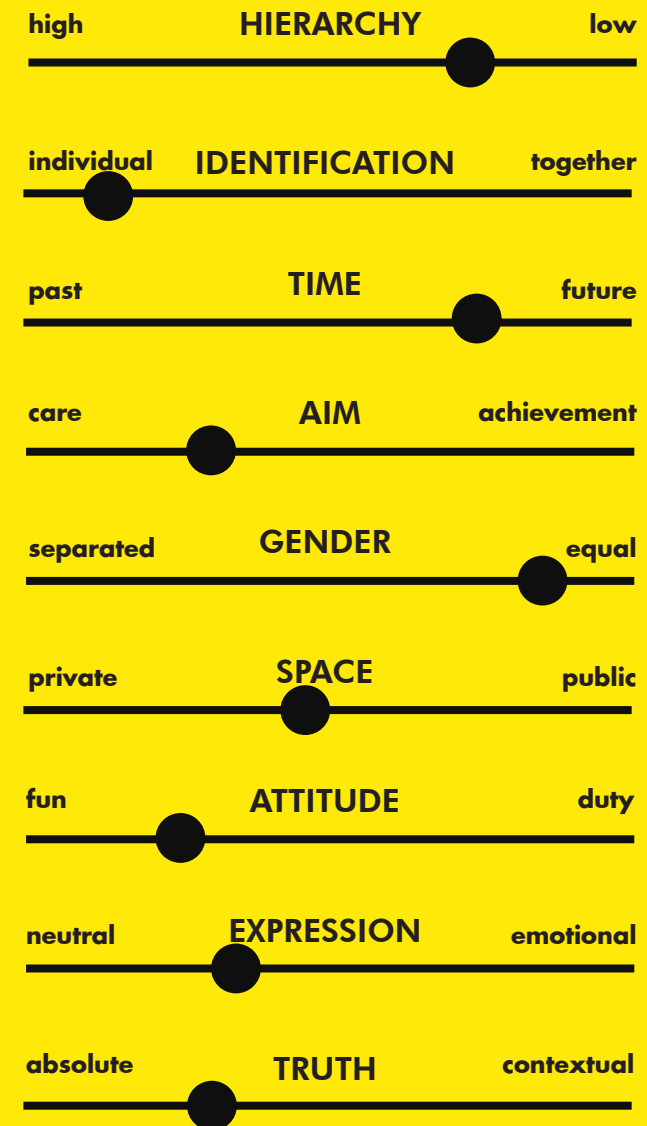


Fig. 14, Socio-cultural dimensions average of Dutch culture. Derived from Hofstede (2018)

DUTCH DEAF SOCIO-CULTURAL DIMENSIONS

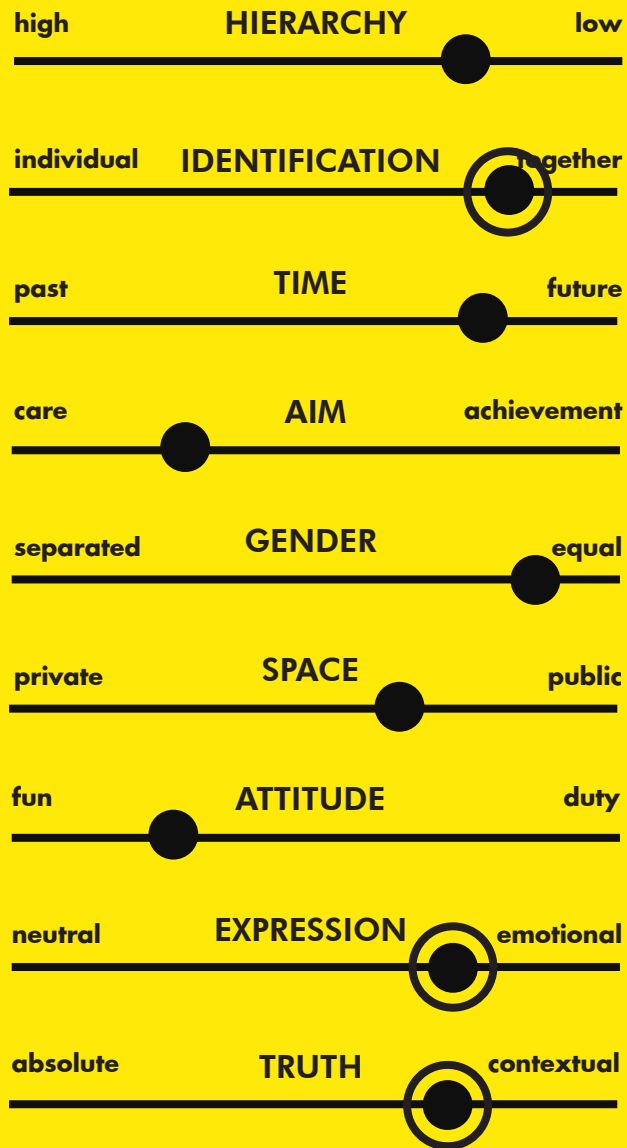


Fig. 15, Socio cultural dimensions derived from insights gathered from research discussed in chapter 2.1 & Appendix B.

Fig 16. Tobias de Ronde (born deaf) during documentary 'Doof Kind'.



"On one hand I wanted to show how a deaf boy has a handicap and on the other hand that if you change the circumstances a little bit, the handicap disappears and transforms into culture."

-Alex de Ronde (Father of Tobias de Ronde and film maker of 'Doof Kind')



2.3 Personas

Previous research is combined with methods of inclusive design, as this study is not just about comparing cultures, but also including one into another. Therefore, insights were gathered from me, a Dutch hearing person, experiencing one day of walking around at a festival feeling like a Dutch deaf person. (appendix B)

Afterwards personas set up based on these socio-cultural dimensions, my own experiences and desk research. These personas are used as fictional users of the design to be able to judge concepts quickly. However, of course there are many kinds of deaf people and every one of them should be included in this design. Anybody in the spectrum from deaf to hearing should benefit from this design.

Julia Janssen

Julia Janssen is a 27 year old dietician. Additionally, she is following a course in Spanish, as she is always curious about new things and cultures. In her free time, Julia tries out all kinds of dance classes, from Hip-hop to ballet. Julia loves to discover new music and therefore tags along with a different group of people every now and then to different festivals.



Sophie Heeren

This is Sophie Heeren, a 25 year old who just finished her education to teach at a school for deaf children. She is considering going to America to go to university there. She has been deaf from birth and has a big group of friends around her who are also deaf or hearing-impaired. She is very blunt and likes to tell everything that happens to her friends. Sophie visits two festivals every year, Sencity (especially inspired by deaf people) and Lowlands. She visits the festivals because she loves to hang out with friends and do crazy things. Being deaf brings her in some funny situations, but most of the time she feels very dependent on hearing friends when she needs something from a hearing person.

Mik Heeren

Mik Heeren is Sophie Heeren's younger brother of 23 years old. They have always been together, as Mik can hear and is able to translate speech to sign language. Mik is a medicine student and loves the honesty of the group of friends of Sophie. Unfortunately, they do not always understand his taste in music, so sometimes he wanders alone at the festival.

3.0 CONTEXT

This partnership with MOJO and TU Delft creates an opportunity to use the community-based festival environment facilitated by MOJO concerts to close the currently existing gap between deaf and hearing people in society. According to Jan Packer et al. there are four main motives to visit festivals according to hearing festival visitors, namely: the music experience, festival experience, social experience and separation experience. This knowledge is used to understand how these categories reflect onto deaf people's festival experience and compares if these motives are the same for both target groups.

3.1 Mainstream festival vs Festival inspired by deaf people

Currently there are two kinds of festival categories for deaf people to visit, either; festivals especially focused on deaf social young adults, like Sencity and Mutesounds or festivals focused on general festival visitors. From all Dutch festivals, 44% are

pop-music festivals, with all together 14 million visitors in 2015. (Redactie cultuurmarketing, 2015) These visitors have an average age of 24 years old, although 86% of festivalgoers thinks you can never be too old for festivals. (Marz, 2010) No clear numbers are available on the kind of festivals that deaf people like to visit except for the festivals where sign dancers are requested. These festivals are mainly pop festivals like appelpop and parkpop. However deaf people can also be found at festivals like Lowlands or Defqon to visit electronic music. (de Ronde, 2017) Unfortunately there are no hard numbers on this, since these festivals never did research and sign dancers are not requested as these songs do not have lyrics. Electronic music is preferred by deaf people, because of the rhythmic bass in the music which can easily be followed by deaf people when standing close to the speakers. (de Ronde, 2017)

Observational studies are executed to distinguish the biggest differences in experience between these two festival categories. A visit to Sencity and a conversation with Tim Arets, social media responsible from Sencity, helped to grasp understanding of festival focused on deaf people. Ohm Festival, Pleinvrees, 'Down the Rabbit hole' and Lowlands were observed to get an understanding of mainstream festivals of

pop culture and electronic music. Extra research is done at Down the Rabbit hole about the specific MOJO festival experience, by interviewing festival visitors within the context. (chapter 6.2)

Sencity is a multisensory music festival, with deaf people as their inspiration source. At the festival they had: a sensefloor, scentjockeys, foodjockeys, textjockeys, sign dancers and several art installations to stimulate all senses. These innovations will shortly be explained to get an understanding of the current offer of products and services at festivals for deaf people.

- Sensefloor is a floor that lights up and vibrates on the beat of the music, Technicalities are not revealed, except for the top material which can be wood or plastic with LED lighting. From experience it seems that there are no big technical motors used in this product and it feels similar to standing on a commonly used wooden floor at a mainstream festival.
- Textjockeys create a live visual video by combining text and rhythm. The words also appear on screen similar with the melody of the words being pronounced.
- Scentjockeys diffuse smells through the air, which fit with the core of the music song that is played at that moment. Foodjockeys do a similar

thing by distributing food that fits with the core of the music that is played.

- Signdancers ('muziektolk') create a visual representation of music, by interpreting the text, beat and melody and performing a dance including singlanguage.
- Art installations for deaf people are not focused on music, but they do use multisensory design as their inspirational source. One example played with the fact that touching somebody in the dark together with a big crowd, becomes strange when you can not talk to each other. Another one created vibration in a chair based on the voice of somebody in another chair.



Fig 19. 'Drankenkaart' that was used at Parkpop 2018 to make ordering drinks easier for Deaf people. Derived from Doof.nl

Next to festivals that are inspired by deaf, some more mainstream festivals are also looking into possibilities to make their festival more accessible for deaf people. For example, Parkpop 2018 used placemats especially made for deaf people to make simple things like ordering a drink more independent and easier for deaf people. (Redactie Doof., 2018)

Overall, Mainstream festivals focus less on multisensory stimulation than festivals focused on deaf, although this is an upcoming festival trend (mmalivuk, 2017) At electronic music festivals, like Ohm and Pleinvrees, we can observe a significantly bigger amount of multisensory designed festival features compared to Lowlands. Tactile stimulation occurred by surrounding factors like sand, grass or water, but the tactile sense is also stimulated through music by holding balloons or touching wooden objects or speakers. Both festivals also show several light shows and art objects. Another noticeable insight into multisensory design at festivals is the effect of darkness. All senses feel more stimulated when the surroundings are dark, this makes visitors less distracted by their surroundings and makes contrast with light bigger. Although visitors also mention to feel by themselves and less eager to talk

Fig 20. The subpac backpack. (Subpac, 2018)

Conclusion

Conclusions can be drawn from this research that are interesting to keep into account during the rest of this study:

- Mainstream festivals are also interested in including deaf people into their event.
- Mainstream festivals have less multisensory stimulation, although this is an upcoming trend and is booming in electronic dance festivals.
- Sign dancers are extremely resourceful for deaf people, although for hearing people signing is not understandable.
- Visitors at all festivals mention to feel playful, actively involved and want to be surprised.

Innovative



Individual use



Use together



Low-tech

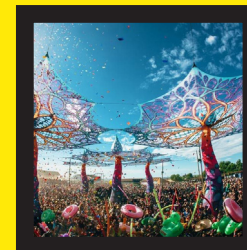
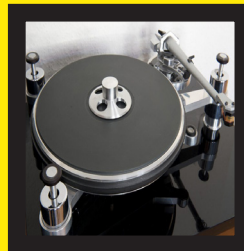
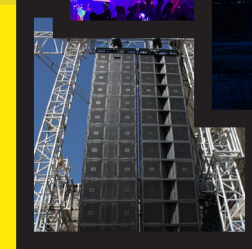
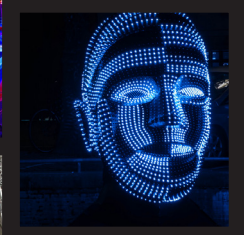
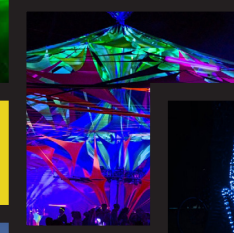
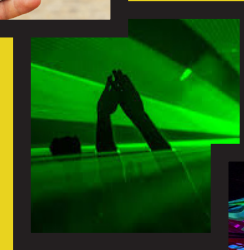
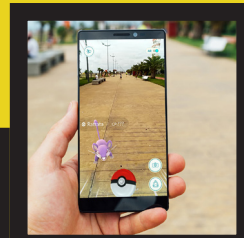
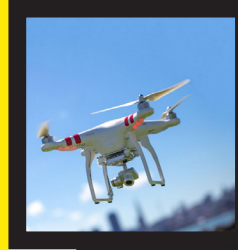
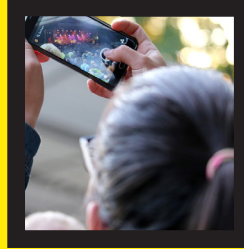
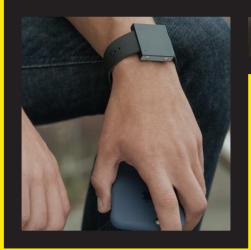
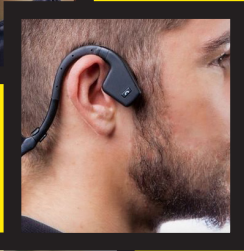
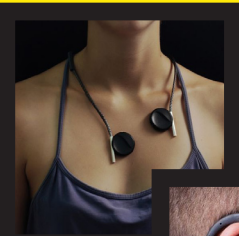
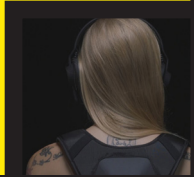
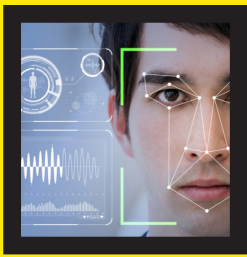


Fig 21. Music (festival) innovations featuring all senses, mapped according to individualness and innovativeness.

3.2 Market analysis

In this chapter current trends within multisensory design (at festivals) are researched and compared. The market analysis is done by desk research, observations in the field (Chapter 3.1) and by talking to experts. These trends are clustered in usability and a perceptual map to find the most promising innovations for this thesis.

Livestreaming, drones, cashless payment, VR(Virtual Reality) / AR (Augmented Reality) and touchable technology are fast emerging technologies in the music festival market. (mmalivuk, 2017) Especially the latter, with a focus on multisensory design for festivals, is interesting for this project.

Several products can be found that enlarge the feeling of lower frequencies and thereby make the user physically feel the bass. Subpac does this on the users back, while Lofelt has found technology to get this sensation within a wearable bracelet. (Lofelt, 2018; Subpac, 2018) Although these technologies are a good addition to music for hearing people, deaf people are still not able to perceive high frequencies by using these products.

Visually there are also several techniques on the market to give an extra layer to the music. Examples of these techniques are projector mapping, laser shows and drone shows. Even though these projects give an additional layer to the music, it

is often not possible to distinguish a certain song based only on visual information. (Chapter 8.2)

At a festival like Sencity multisensory based technology goes a lot further compared to mainstream festivals. At Sencity we see scent and food DJ's, sign dancers, vibrating floors, text DJ's and art installations based on the haptic or visual sense. To reach the full potential of multisensory music at festivals, we need to look further into emerging technologies and ways to stimulate senses and interaction. New technologies that might have potential but are not yet used in this context are ultrasound or water frequency waves for example.

Although many of the current solutions to translate music into haptics or visuals, focus on individual use. This project will focus on experiencing music in the festival context. There-fore, it is interesting to look also at the social aspect of music. Currently there is little knowledge in the field of using music as a means of communication between deaf and hearing people. There are products that use combinations of haptics and sound like CRDL design, which is a product that stimulates interaction between elderly by letting them create sound by touching each other. (CRDL, 2018)

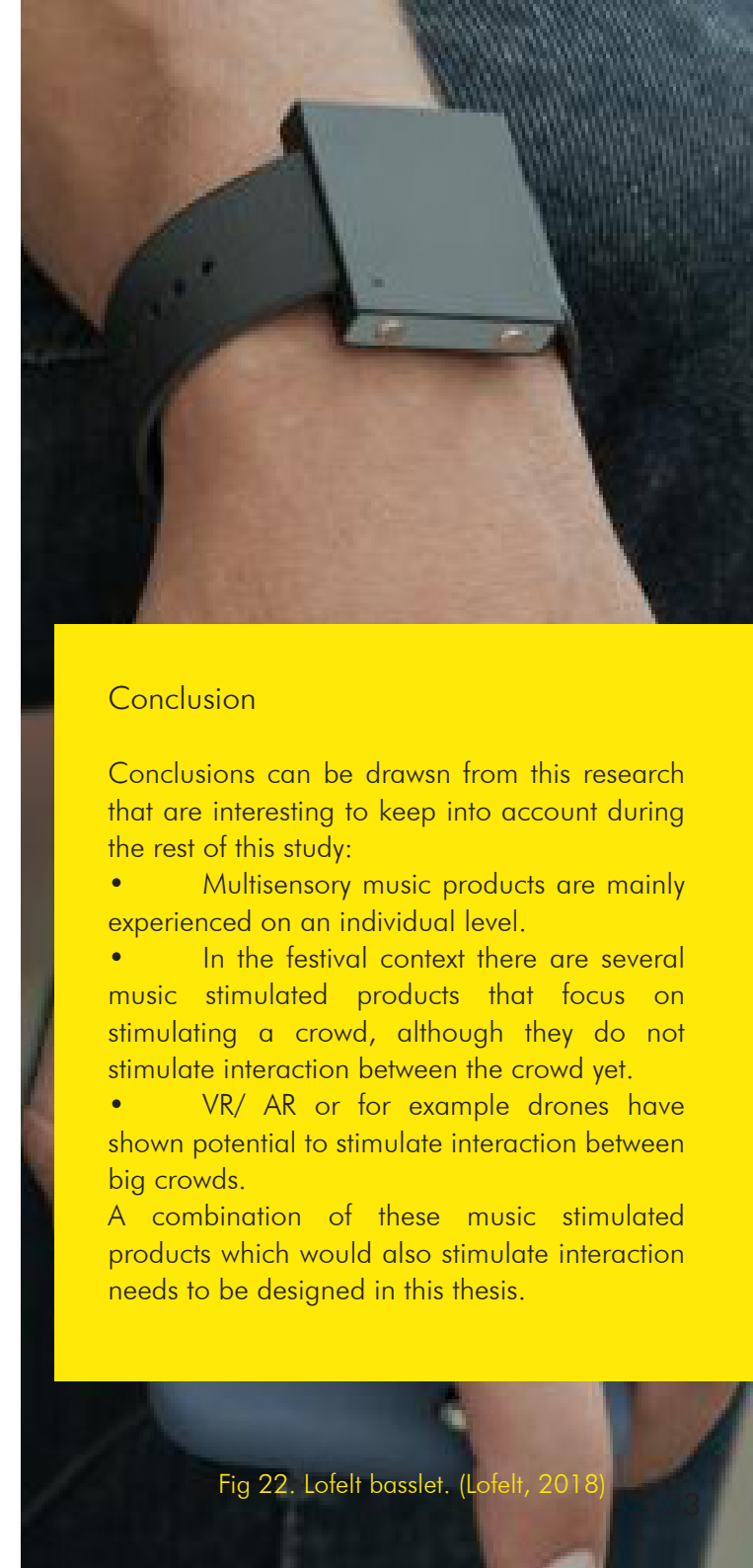
Conclusion

Conclusions can be drawn from this research that are interesting to keep into account during the rest of this study:

- Multisensory music products are mainly experienced on an individual level.
- In the festival context there are several music stimulated products that focus on stimulating a crowd, although they do not stimulate interaction between the crowd yet.
- VR/ AR or for example drones have shown potential to stimulate interaction between big crowds.

A combination of these music stimulated products which would also stimulate interaction needs to be designed in this thesis.

Fig 22. Lofelt basslet. (Lofelt, 2018)



4.0 MUSIC AS A STRUCTURE

This chapter includes explanation about music as a structure instead of sound, which is necessary information to be able to understand the basics of visual and tactile music. (Bader, 2018)

4.1 Visual and Tactile

Flora Koene, a graduate in visual and tactile music, explains how music can be seen as a structure and sound as the material in which we express this structure, during an interview. She researched these structures and is currently doing exploratory research on how we can translate this structure into visual and tactile music instead of audible music.

Music can be split in several higher level concepts, for example meter, rhythm, form, space, instrumentation etc. Some of these concepts can be perceived by our other time sensitive senses, sight and touch, for instance meter, rhythm, form, space, instrumentation etc. while others exist only in sounding music, like melody and harmony or only exist in visual music, like color, or in tactile music, like texture. (Koene, 2017)

Visual music, according to Flora Koene:

“A sequence of images experienced in time which are characterized by higher level concepts such as form (beginning, middle and end), meter, rhythm, shape, space (location and direction), instrumentation, amplitude, size and could be characterized by color and texture, with which patterns of predictability and surprise and patterns of tension and release are established.”

Tactile music, according to Flora Koene

“A sequence of tactile stimuli experienced in time which are characterized by higher level concepts such as form (beginning, middle and end), meter, rhythm, space (location), instrumentation, amplitude, size and texture with which patterns of predictability and surprise, and patterns of tension and release are established.”

Several designers and musicians have tried to make a structural translation of music into tactile or visual sense by linking tones to colors or different vibrations.

Most of these ideas conclude that it is difficult to make a literal translation, because of cultural differences or a non-instinctive use. For example; Vibrato, designed by Shane Kerwin (Perton, 2005) and color scales of Nick Anthony Fiorenza (Fiorenza, 2003-2016), Newton (Hutchison, 1997-2017), and Scriabin (Lucy, 1986-2000) Rather than using a direct link, this research will focus on bringing the same kind of emotion in music to the perceiver (deaf and hearing).

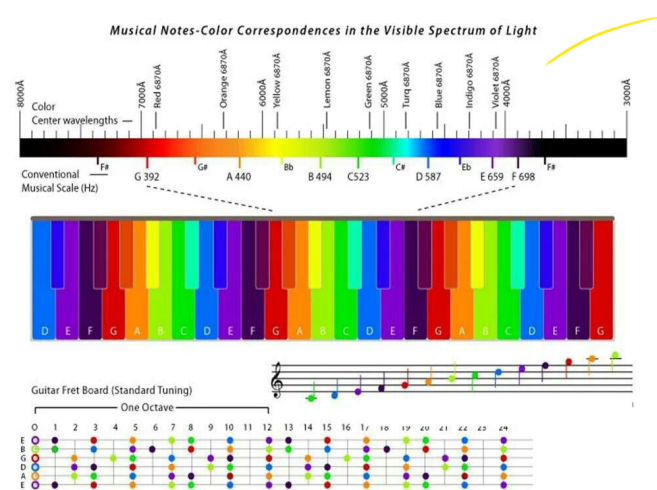


Fig 23. music colour theory of Nick Anthony Fiorenza (Fiorenza, 2003-2016)



Fig 24. Flora Koene at her working station during the interview.

Facial expression and body language is needed to get emotional expression in visual music.



Fig 25. The tactile music tool designed by Flora Koene.

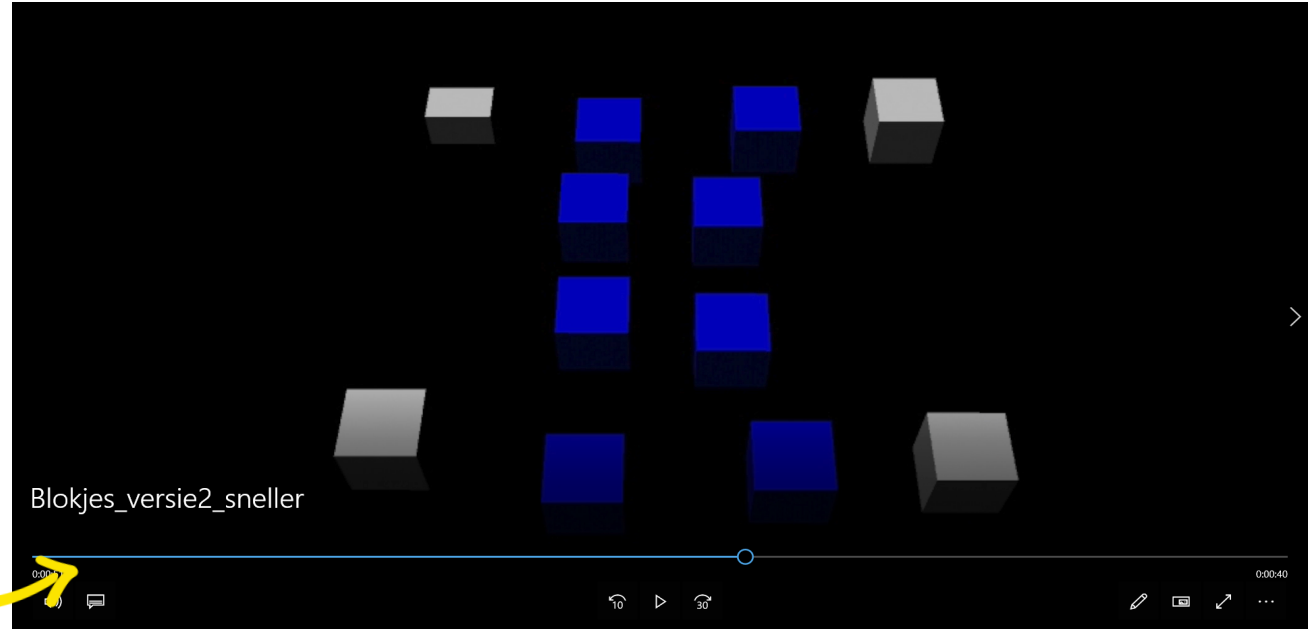


Fig 26. Visual music song design one, where blocks represent the structure of the music.



Fig 27. Visual music song design two, where movement, facial expression and colour are used to represent musical elements.

NEGATIVE EMOTIONS

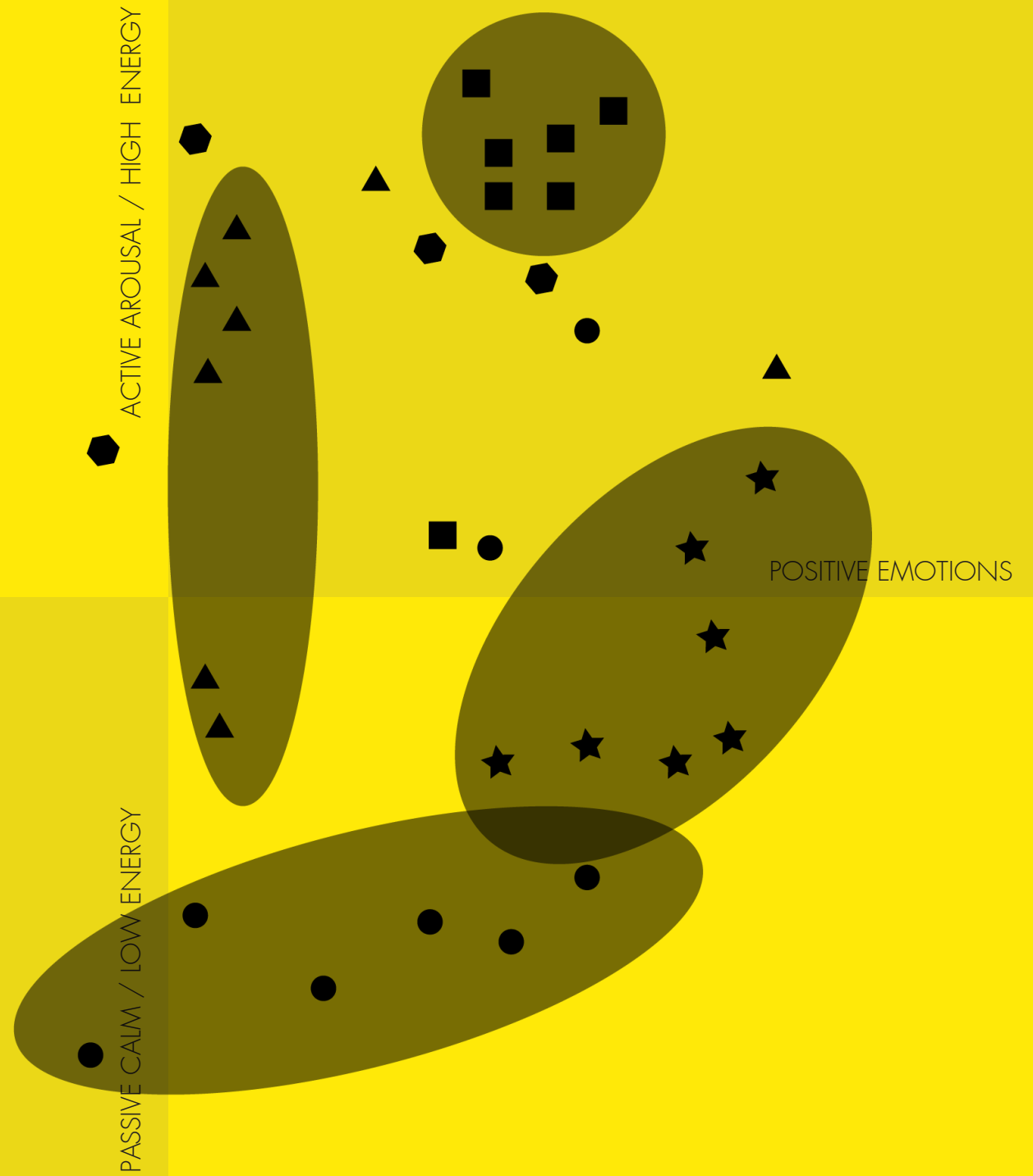


Fig 28. Visual music song design one, where blocks represent the structure of the music.

4.2 Music and Emotion

In this chapter the kinds of emotional reactions on music are explained and analyzed. This will create the grounding of emotional design of the design.

According to Juslin and Västfjäll all emotional reactions to music can be categorised into seven mechanisms. Five of those mechanisms are further explored in terms of music genres, kind of emotions and relation to deaf music. Two mechanisms are left out because they rely on past music experience, which are currently not present for deaf people and therefore not the focus of this thesis. By asking several hearing festival visitors about their emotions and explanations about these categories provided interesting results. (Fig 28)

Musical Expectancy

Musical expectancy evokes emotions in the listener, because it does not match the 'rules of music'. As the user has learned these over time, musical expectancy is not present in young children.

Emotional Contagion

Emotional contagion is the empathic response a listener has to certain sounds in music. The music can sound like the voice of a human with a certain emotion.

Visual Imagery

Visual imagery creates an emotion connected to

the visual representation that the listener imagines within the music.

Brainstem reflex

The brainstem reflex is a short and instant reaction on a sudden sound or loudness in the music.

Rhythmic Entrainment

Rhythmic entrainment is the emotion evoked by the rhythmic sounds. It can for example feel pleasant to hear a rhythm that resonates with your own heartbeat.

Brain stem reflex is interpreted as a short part in the music and therefore the emotions are mixed and can not be interpreted as one 'genre', style or emotion field. Rhythmic entrainment evokes mostly desire, energetic, euphoria and excitement as emotions. The songs that came up were mostly positive and energetic as can be seen in the figure on the left. Musical expectancy is mostly seen as amusement, energetic, excitement and fascination. Although, compared to rhythmic entrainment, these songs are more passive, and the emotions are mixed. The songs the participants chose are either humoristic or alternative. Visual imagery can be found mostly in very positive emotions and is often seen as a dreamy state of being. The songs are often without song text. Last, emotional contagion can be found mostly in the

passive and negative side of the emotion space. This could be, because listeners are more aware of their emotions when the music is more passive.

Looking at all emotional mechanisms there are also songs that overlap several mechanisms at the same time. This can be explained by the complexity of categorizing emotional responses on music. (Juslin & Västfjäll, 2008).

Reflection

Deaf people were also asked to fill in the survey, but they either said they were not recognizing the feeling or did not understand it. This could be caused by the explanation being based on sound, the kind of deaf people that were reached was via a Facebook page and they did not feel addressed, or because there were simply not enough deaf people reached with the survey.

Conclusion

A few important factors that emerged that were repeatedly noticed through the exploration. Explanation about emotions gathered with Rhythmic entrainment and Emotional contagion were similar to emotional responses of deaf people to music. Therefore this study will focus on these two categories and enhance this feeling through visual and tactile music.

4.3 Rhythm

Rhythmic entrainment is seen as the most intuitive emotional response to music, because the cerebellum is involved in processing the rhythm in music. A musical rhythm is a pattern of temporal intervals in a stimulus sequence (fig 29) Musical rhythm originates in walk, dancing and tapping feet. Therefore, people like a musical rhythm when it resonates with their internal rhythm. (Scherder, 2017)

This phenomenon of an internal rhythm comes back during desk research and the context mapping session with and about music experience without audio. Since rhythm can be communicated via other media like light or vibration this is a useful source as a start of the design process.

To understand the complications of haptic music the Lofelt Bracelet, Basslet was tried. This bracelet translates the bass, of every music you play on your phone, into vibrations. The feeling of the bracelet is similar to what can be experienced in front of a speaker at a festival, although this is only experienced on the arm and not the entire body. When testing and asking other designers to test the product I obtained several insights:

- Vocals and higher frequency sounds can be felt as long as there is no lower frequency



Fig 29. Illustration of a musical rhythm and its associated. From book_SpringerHandbook.

sound, like bass.

- It is (almost) impossible to guess what song is playing, unless the song has a very particular baseline instead of a standard number of beats per minute that a lot of songs share.
- The rhythm of certain songs does give participants the same intuitive response as dancing. Rhythmic entrainment is present when only feeling the music through the Basslet.
- Musical expectancy and brainstem reflex also seem to be present while feeling the music, since the participant seems to react happy or surprised when feeling certain parts of the music.
- Other emotional experiences like emotional contagion and visual imagery are less present. (Chapter 4.2)

Conclusion

To create a greater emotional reaction of purely visual and tactile music, like the audible version of music, another layer needs to be added. Considering market analysis and the needs of the target group, emotional contagion seems like the most promising category to enhance by the design of this project. Emotional contagion can be seen during (sign) dance performances, which are mentioned as very valuable for deaf people to perceive music.



Fig 30. Two participants trying out Lofelt Basslet by letting one guessing the song that the other person put on.



This section shows the scope, guidelines, the design goal and interaction vision that are concluded from the analysis phase. This definition is the foundation of the brainstorming phase.

DEFININE

5.0 FRAMING DIRECTION

This chapter will define the scope, guidelines and the solutions space of this thesis based in the research of the previous chapters. This results in a design goal and desired interaction qualities and interactions.

5.1 Scope

The scope will define the boundaries that are set for this design, based on an interaction diary, concluded from previous research within the festival context.

Interaction diary

An interaction diary is a representation of all locations where verbal and non-verbal interactions between the target groups (Deaf festival goer/ Hearing festival goer/ Friend of deaf festival goer) can be found. Within these interactions mismatches can be found, which are the foundation of the solution space. This interaction diary holds not only interactions between both target groups, but also interactions with music, focused on multisensory exploration.



In this interaction diary, not only mismatches are shown, but also strong interactions between deaf and hearing people that should be encouraged and increased.

Dance is music

For example positive interaction can be found during dancing at a festival. Deaf people interact with hearing people via dancing and the floor starts bouncing which is enjoyed by deaf people as tactile feedback about the music.

Private spot

Deaf people tend to stand really close to the biggest speakers existing at the festival. Which is a place that hearing people normally avoid, because they find the music too loud at this spot. Even though this is a positive experience for deaf people, this does divide their group from the group of hearing people.

Performers show

At this spot the stage is clearly visible so deaf people get a clear visual impression of the performer, which also enlarges their experience of music.

Strange looks cause interaction barrier.

One inconvenient interaction between deaf and hearing people is a strange look from hearing people. When seeing deaf people sign at a concert, hearing people often ask themselves the question what deaf people are doing at a concert. The step to ask this question is too big, because of the language barrier, which leaves only an uncomfortable stare.

Ordering drinks together

Ordering drinks or basically any conversation where contact is needed with staff is difficult for deaf people. However, of course there are several ways to order like pointing, signing or asking a friend who is hearing.

Talking with loud music

This language mismatch can be convenient as well, as deaf people are able to have conversations when the music is really loud, in contrast to hearing people.

Missing out on Laughter

A mismatching interaction that is not only seen at a festival, but a bummer for deaf people at every event, is random laughter. Often deaf people see a group laughing, but missed out on the joke, because it was either a verbally spoken

joke or they did not notice something was going on, before the joke already ended.

No Dance no Music

The biggest input for deaf people is the dancing crowd around them. This crowd shows visual representation of music and creates vibrations in the floor when jumping for example. Whenever the crowd is not moving so much, because of either calm music or because the crowd is just non-active, deaf people miss a big part of their experience of music.

Conclusion

Most conflicting and positive interaction can be found on and close to a stage with a live performance going on. Therefore, the scope of this project will be to design a product that can be used during a live concert, using live music as communication.

5.2 Guidelines

The guidelines are a summary of the most important insights gained from the research phase, which need to be considered during the design process. The Guidelines are based on wishes and needs of all involved stakeholders.

Together

The interaction has to involve more than one user in a direct or indirect way.

Rhythm

Rhythm is the most intuitive and emotional part of tactile music and therefore has to be present in the final concept.

Dance

Dancing is the most intuitive and emotional part of visual music and therefore has to be present in the final concept.

Intuitive interaction

The interaction has to be intuitive to fit in the context of the festival experience.

Surprising interaction

The experience has to be surprising to get all participants in a spontaneous mood, which initiates interaction with strangers.

Easy to follow

The haptic and visual stimulation should have a clear structure so deaf people can see the music instead of being overwhelmed.

Emotional contagion

Emotional contagion is an emotional reaction on music with a lot of potential and should therefore be present in the final concept.

Tactile and visual

The tactile and visual sense are the two senses that have potential to replicate the complicated structure of music.

Respectful

The interaction should be respectful to all participants by understanding each others wants and needs.

Inclusive design

The design has to take the entire spectrum from deaf to hearing into account and everybody should be able to participate.

Independent

A deaf person has to be able to participate in the design independently.

5.3 Solution space

Mismatches between the target groups, within the interactions of both target groups in the context of a festival, are the foundation of the design goal. A few interesting questions from mismatches are: How might we enable hearing people to understand what deaf people experience at festivals? How can we enlarge the emotional experience of music for deaf people? How can we create an environment where nobody can use their common language? These mismatches can be combined into one final design goal:

Design goal

Design an installation/ product that makes deaf people independently lay contact with hearing people during a live concert via their intuitive behavior on music, which is most strongly created by stimulating the tactile and visual sense with rhythm and movement.

Interaction vision

To reach this design goal we need a playful, surprising and intuitive interaction. These qualities will be kept in mind by using an interaction vision throughout the design process. The interaction vision will be used to validate if the interaction qualities are present in the brainstormed design. The interaction qualities are also present in the following metaphor:



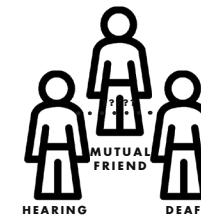
Fig 32. Children playing with soap bubbles.



The interaction should feel like children chasing soap bubbles together.

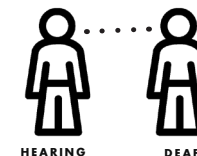
CURRENT INTERACTION

AWKWARD
DEPENDENT
CLOSED



DESIRED INTERACTION

PLAYFULL
INTUITIVE
SURPRISING



DE

This section discusses first brainstorming sessions and how the first ideas are further developed and conceptualised.

VELOP

6.0 CONCEPT DEVELOPMENT

After a first brainstorm session about the initial problem statement. This statement is split into subproblems (Boeijen et al., 2014) for faster solution finding. This subproblems, also called How to's, are brainstormed upon during discussions together with the participants of the creative session. They are four students from industrial design engineering masters to get more diverse ideas and to build on eachothers creativity. Industrial design students are chosen for this session, because they are trained in design thinking. The sub-problems where:

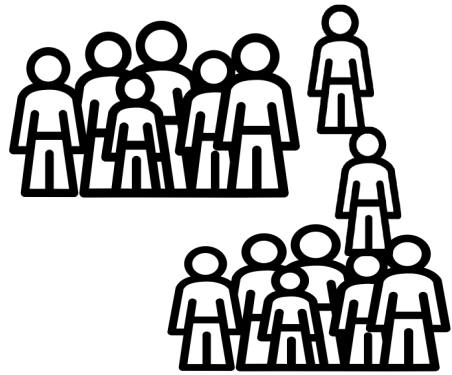
- 1) How to stimulate the haptic sense together with others?
- 2) How to mimic facial expression during a concert?
- 3) How to enhance rhythm during a concert?
- 4) How to show (visual) song text during a concert?
- 5) How to interact with a deaf person?
- 6) How to interact during a live concert?

After the creative session the sub-solutions are combined and detailed using WWWWWH. (Who, What, Where, When, Why, and How) Fast judgements of first ideas are maid with the personas in mind. Several concept ideas came from this and were later evaluated by interviews with the target group. (chapter 6.2)

6.1 Concept directions

Short sprints are used to develop the final concept ideas. During the sprints several small prototypes tests or interviews where done. Insights gained from these interviews, created the input for the final development and selection of concept ideas. One more explorative research was done within context during Down The rabbit Hole and will be discussed in more detail. The concepts that where discussed during these interviews are explained on the right.





**SIGDANCE
WORKSHOP**

Signdance workshop

Sign dance workshops at festivals. These workshops will increase publicity of sign language, make people feel united and is a playful way of getting to know deaf culture.

Fig 33. People during a concert wearing a bracelet to show they did the sign dance workshop. Adapted from glubbs.tumblr.com



HEARING

Tactile dance stimulation

This design will make deaf people able to choose their focus in the music, while using their tactile senses. A bracelet will vibrate on the music while the user chooses the frequency/ instrument. Users will playfully interact by feeling each other's 'frequencies'. (Fig. 34)

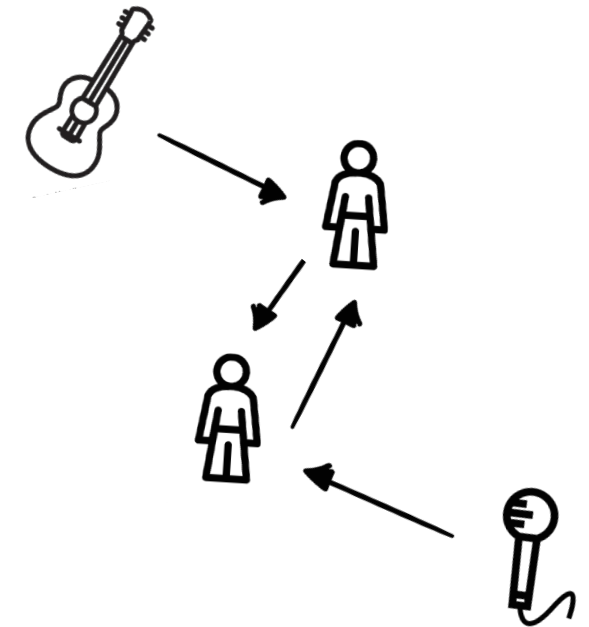


Fig 34. Deaf girl feeling the vibrations of the dances of other festival visitors. Derived from i.pining.com



"I am used to listen with my ears and not with my haptic sense so I can't find the details in this"

Fig 35. Two man being interviewd about tactile music concept during DTRH Festival.

6.2 Concept selection

Here is discussed which solution space is most promising for future design purposes and why. This decision is based on opinions of visitors of a big MOJO festival, Down the Rabbit hole.

At Down the Rabbit Hole ten people were interviewed, about their experience in interacting with others at festivals and about possible interactions with deaf people. The interview started very open about interactions with strangers and afterwards participants where asked about interactions with deaf people. Participants also got to experience deaf music experience by using the

Lofelt Basslet and watching sign dancing videos. I discussed both concept directions and asked them about their opinion.

The main insights were that meeting new people by small interactions happens very often at festivals and language is not always needed, because it is more about doing activities or sharing the same interest. As an example one interviewee mentioned climbing on a raft together and just laughing while falling off or mimicking dancemoves of strangers. All festival visitors had a very curious mindset and where therefore interested in deaf culture and their

experiences at a music festival. The Basslet got positive response, although most visitors missed a certain melody of higher frequenties of the music. It did help them to understand how deaf people experienced music at a festival and got them thinking about other media as well like lights and dancing. Beyond my expectations sign dancing was known by almost half of the interviewees. They brought up the topic themselves or immediately told stories about movies they saw online.



“At a festival you are not really talking to strangers, you are mainly doing random things with random people”

“A festival is a free space where people want to be silly”

Conclusion

This development during several iterative phases led to the insight that a combination of both ideas is necessary. Also, some elements of the design goal and interaction vision are missing and should be added. The most important changes and adaptations that should be made are:

- Only haptic feedback is not enough to enjoy the interaction for a hearing person.
- A game like element is wanted in the context, although the concept should be more intuitive and should stimulate more interaction.
- Although learning sign language is seen as interesting by hearing festival goers, they also mention that they are not able to remember enough to get comfortable in a conversation with a deaf person and they would be afraid to perform as they are then seen as responsible.
- Sign dancing is seen as very interesting by hearing people and useful for deaf people, although hearing people think a sign dancer intervenes with the show of the artist.

These changes are used in several small design cycles which then resulted in the final design. The final design will be discussed in chapter seven of this thesis.

Fig 36. Collage of quotes and pictures of people who where interviewed at DTRH Festival.

EVA

This section discusses the evaluation of the final design, including the explanation of the final design proposal.

EVALUATE

7.0 FINAL CONCEPT

7.1 Concept explanation

'Everybody Dance' is an interactive dance game, with intuitive dancing during a live concert as the input. This input is one person in the crowd that is chosen as a well communicative dancer for deaf people. A camera man/woman will choose who this person is, and this person will be digitally transformed into a character. The character will show dance moves that the participants need to imitate. When the participants perform the right dance moves they will be rewarded by extra visuals and tactile stimulation in the floor they are dancing on.



Vision

With this future design I stimulate dancing of hearing as well as deaf people and use dance as the main source of communication. Like stated in the interaction vision, communication is meant as a quick interaction where both parties understand the game intuitively and have fun together.



Fig. 37. Render of final concept 'Everybody Dance'.

7.1.1 Character

Having a digital character instead of the direct camera images has several benefits. First, a character anonymizes the dancer, which makes the dancer less afraid to keep dancing, even though he/ she is exposed. Also the character on itself will potentially stimulate crowds to dance more active and clear, because of the probability of being translated in this character. Although this needs further research and testing. Secondly, the character will become a statement and recommendation point of independent music enjoyment for deaf people. This can be a conversation starter as well as an innovation starter. The character can be used for several purposes like literal translation of text into sign language and afterwards combine both sign language and what the character learned from dancing into automated sign dancing, using machine learning. To fit the purpose of this character, it needs to have a timeless look, not genre specific but still have a festival vibe.

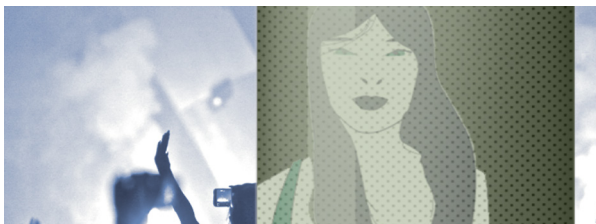


Fig 38. possible representation of a digital character in context.



Fig 39. dance mimicking game (Mocap, 2011)

7.1.2. Technology

The driving technology behind this concept is similar to the microsoft kinect camera module. When playing the game the Kinect is able to distinguish full body motion and create a vague simulation on a screen. Using vvvv* there have been several tests that show creating a digital live dancing character is possible. A chosen dancer from the crowd is translated into a digital character using this technology. (Wang & Wang, 2012) The movements of this character will than be shown on a screen and imitated by two participants. These participants will be tracked by similar Kinect camera's to find similarities in the dance of the character and the dance of the participants. (vvvv, 2017)



Fig 40 Children mimicking a dance game while only one is playing. (Malamut, 2017)

7.1.3. Interactive game

A game is played to stimulate intuitive interaction as mentioned in the interaction vision. The game will stimulate people to imitate the character, which has a big effect on deaf people. The character is seen as the initiator of the moves, the game players as the first imitators and the rest of the crowd will follow according to this social experiment theory of Stephen, A. T., & Berger, J. A. (2009). (Breda001, 2016) As observed during Lowlands, imitating is a intuitive interaction, when looking into dance. A crowd doing the same dance is an easy to follow visual representation of music, which does include emotional expression of body and face.

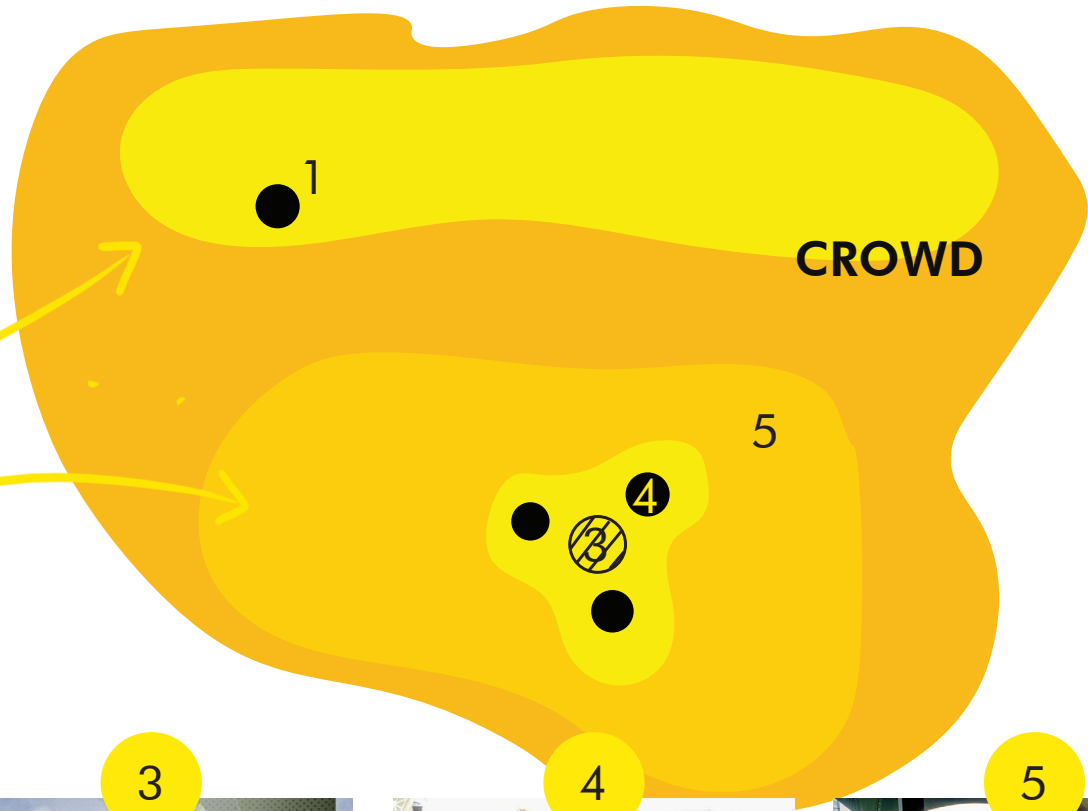
7.2 Scenario

A scenario is drawn as a visual representation of the concept. First the placement, within the scope of a live concert, of the people of the interaction can be found in the figure on the right. The numbers in the figure correspond with the numbers above the pictures, which show an image of the interaction at that place in chronological order.

● 2

Actively dancing crowd at the front of the stage.

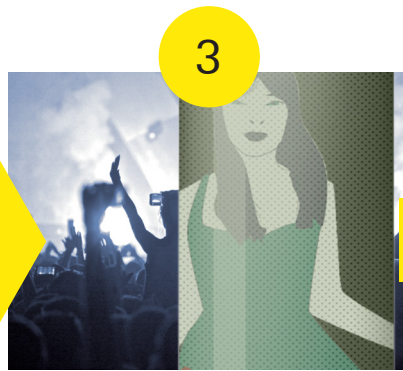
Actively dancing crowd, because of the new interactive experience.



Person 1 is the chosen dancer from the crowd. He/She is chosen because of clear and easy to imitate dancemoves.



Person 1 is chosen by a special camera man, that films his/her dance performance.



The dance is digitally transferred into a digital character which is shown at a different spot in the crowd.



People around the character can 'play' by mimicking the character. As a reward they will get visual and haptic feedback.



This active interaction will stimulate everybody around the players to dance more active.

Fig. 4.1. Top view map of festival crowd. Dance activity mapped in colour.

7.3 Feasibility

The feasibility of the design is discussed in terms of the desired effect of the design on the environment, possibility of technology development and a rough cost estimation is made to show that the design fits within the budget of an organization like MOJO.

Environment

First, from research is concluded that rhythm and voice are extremely important to convey the emotion of music. Although the content of the lyrics is often not the reason of the emotional connection to music (chapter 4.2) More often people react emotionally on the sound of the words and the emotional expression of the musician. When we exclude sound and try to translate this emotional expression into visual and/ or tactile expression, this expression can best be shown by human dance performances. Improvised dance is already often performed by a crowd during a live concert, although not everybody is constantly moving on every song. When songs are calmer or people standing around are not actively involved in the performance, dancing is less often seen. For deaf people this makes a huge difference in their experience, since dances of hearing people are one of their biggest inputs of music. (chapter 2.1)

Secondly, this research has shown how important small independent contacts can be for an individual. Because deaf people are often dependent on

friends, family or a sign interpreter, they value their independence and like to be independently involved in more activities. During a live concert, the main communication source of hearing people, talking, can't be used anymore because of loud music. A common way of communication therefore is, dance and signing. Within this context deaf people are included, because they are like everybody around them.

Technology

The design of a similar game of the two elements of the game in this design (freestyle dance to character and mimicking dance moves of a character) are tested with 3D Mocap Dance Moves (Mocap, 2011) This shows the feasibility of the game element in this concept. Further development is necessary in detailed recognition of a person in a crowd and the desired feedback for players during mimicking of the dance moves. Cylindric display screens are already used indoor and outdoor (Screencommunication, 2018) and 6dcreations provides vibrating dancefloors. Although according to observations at

Sencity (Appendix C) this floor needs some further development for the desired effect.

Costs

The main costs would consist of game development, because live music input in games are not very common in the current gaming industry. Screen and floor costs are estimated around 5000,-. Although these can be rented (streetcommunication, 2018; 6dcreations, 2018) where costs get a lot lower for an event like concerts/festival that normally only take 1-6 days. Buying or renting equipment like these is dependent of the frequency that MOJO would like to put the design in use.

7.4 Final interaction test

A final interaction test is performed to test if the design goal and interaction qualities are met. The best way of doing this is creating an interaction prototype.

Method

According to Stephen & Berger (2009) crowds often tend to mimic moves of people in a crowd. This phenomenon can be used to make a big group dance expressive on a live music performance. This test is performed to find out if this phenomenon is present in the current design. If this phenomenon is present the design stimulates the desired effect and therefore achieved the desired goal of this thesis.

H1: The interaction qualities are experienced by hearing-impaired and hearing players as well as some bystanders.

H2: Not all interaction qualities are experienced by hearing impaired and hearing players as well as some bystanders.

First participants are asked to play the game. Afterwards a short interview is done with the participants about their experiences. During the game, recordings are made to further analyse bystander reactions after the testing day.

Test set-up

- 1) Laptop with the dancemovie
- 2) Noise cancelling headphones
- 3) Splitter to connect:
 - 4) Normal headphones with music
 - 5) Lofelt basslet

Participants

The participants are 16 i.d.e. students with an age from 19-27. Every one of the participants has gone to a festival or concert at least ones in their lives and could imagine the situation of a big crowd. Three kind of participant combinations are tested to recreate all possible participant situations.

- 1) One deaf person* playing the game
- 2) A deaf* and hearing person playing the game together
- 3) One hearing person playing the game.

*Since none of the participants where deaf, noise cancelling head phones where used to create a deaf experience.

Context

Because the behavioral reaction of participants and bystanders was the focus of this test, the chosen context was essential. Therefore, a crowded place was chosen where dancing is accepted but not common, idkafee. This creates a similar kind of context as the crowd in the back of a festival/concert.



Fig 42. Two participants playing 'Everybody Dance' while a bystander films.



Fig 43. One participant playing while bystanders look curious.

Prototype

This test is focused on the interaction while playing the game and not on the technicalities of a dance translation. Therefore, a dance performance is recorded beforehand and not live converted in a digital character. Because creating own animation with Adobe animator was not time efficient, existing characters of Strooope (illustrator) are used for the test. All five character of fig 44 are shown in order and move on the beat of the music. If the participants mimic the digital dance well they will get a thumbs up and if they don't they will get a thumbs down.

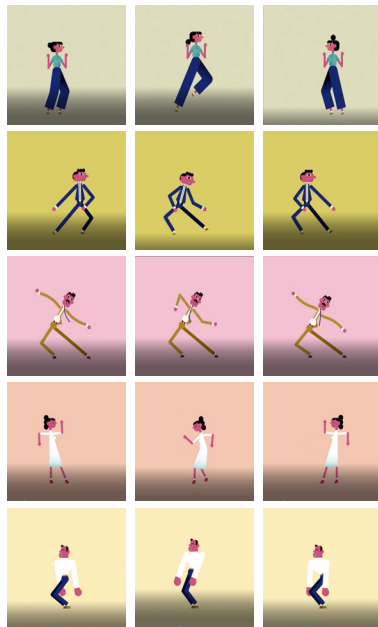


Fig. 44 Animation character design by Strooope (Kyle Strope)

Results

The overall comments of participants were positive and the game was perceived as enjoyable. A few key insights were gathered from the interview that was performed after the dance game.

- The emotion(s) the participant felt towards the 'song' were similar for almost all deaf and hearing participants, except for one hearing participant who found the song calm and not mainly happy. All the other participants named happy as their emotion towards the song that they danced on.

- Most temporary non-hearing participants said they did not have the feeling of dancing on music. All 10 said they were only following the visuals and 6 said the vibrations were supporting this image. This can be caused by 'music' being a word that initiates sound for hearing people, while dance and vibration is seen as 'music' for several deaf people.

“Als ik doof was geweest had ik nogsteeds heel hard kunnen djensen”

- According to 14 out of 16 participants the Lofelt vibration bracelet created an extra connection between them and the video of

dancing characters. 9 of the 10 temporary non-hearing participants said the Lofelt bracelet made it easier to get into the rhythm of the dance and they mentioned it was a useful addition to the game.

- Bystanders were not very involved into the dancing performance. Although they started dancing more when more alcohol was consumed. Bystanders did often look or film their friends perform and some participants were joining the game with a subtler version of the dance. When bystanders are asked why they do not participate, they mention feeling ashamed or not understanding the beat. The last reason is due to the bystanders not hearing the song and would possibly not exist when the game was played during a live concert.

- When participants are asked if they would play the game or dance as a bystander during a concert 15 out of 16 said yes. The most common reason of liking the product was, because people often wanted to dance, but did not know how or they were ashamed of doing a weird dance. They said that if they were copying a dance from a screen together with others they would not feel ashamed.

“Soms wil je dansen tijdens een concert, maar denk je dat het miss raar is dus als iedereen hetzelfde doet zou ik zeker meedoen.”

- Also a statement was made about the digital character. The digital character was preferred over a real live video, because one of the participants would be afraid to be filmed and does not want to be on camera.
- 13 out of 16 participants mentioned that some of the dance moves were too complicated or too fast, which made them less eager to participate. Although some also said that the craziness of the dance moves kept them interested. Overall repeating dance moves were preferred, so people got the chance to learn.

“De bewegingen gingen te snel om te volgen en waren te ingewikkeld. Ik had geen idee wanneer er iets ging veranderen.”

Reflection

Context

Rather than testing at a bar, where circumstances were close to the actual context, the test would have taken place at the actual context, a festival. On the short term of this research it was not possible to find this opportunity, because of organizational issues of planning, safety and privacy.

Song

Only one song and one kind of character was tested. More songs and genres should be tested for accurate results about similar emotional responses.

Participants

As a quick interaction test creating a hearing impaired experience worked. Although also a test with deaf people has to be performed. Deaf or hearing-impaired people have different past experiences with music and therefore react differently to the game.

Results

Results had to be either written down during the interview or afterwards, because the research was performed by one person. This made analyzing the results difficult and important quotes were missing. A better research method in this case is to ask a second researcher to take notes or record the conversations. Although the second option was difficult in a crowded environment like the used context.

7.5 Conclusion

The final design as explained in this report met the design goal stated in the beginning of the report. To reach this design goal, several guidelines were set up which were derived from the research of this thesis. (Pag. 44) The final concept combined several elements to include all elements from the guidelines. These elements are tested and evaluated with all stakeholders.

Festival Interaction

The festival interaction is used and increased by this interactive game. The playful and curious mindset of festival visitors is used to make hearing and hearing-impaired discover tactile and visual music together. By making visitors play a game together they are stimulated to get involved in short non-verbal interactions together. Because the interaction is non-verbal a hearing-impaired person can interact **independent** of their peers.

Inclusive

The concept is based on the enjoyments of music that hearing and hearing-impaired people have in common, instead of their differences is music enjoyment. Also the hearing person is not in an advantage in this context, which creates a common ground for easy interaction between to equals. This inclusive effect can >>

Original design goal

// Design a product or service for hearing-impaired to get a better understanding of music experience at a music festival. This product needs to strengthen the festival experience to enhance the feeling of belonging with other festival visitors. //

Creating a respectful interaction by making use of intuitive dance mimicking behavior.

Dance moves are repeated to create logic in the game.

Creative dance moves are chosen in the crowd to keep players interested and create an element of surprise.

5

3

4

Round screen with three characters so several players can play and still interact with and see each other's mimicry.

Making use of strength of both hearing and deaf (dance mimicking) and therefore creating an inclusive environment.

Visual abstract feedback on the screen for structural music feedback.

Haptic feedback in the ground to create a link between the visuals and the player.

1

Fig 45. improved 'Everybody Dance' render in festival context after recommendations are added. Including the steps of the scenario of Fig 41.



Fig. 45. Prototype of 'Everybody Dance' made for the final product movie.

>> be seen in the final test of 'Everybody Dance' where participants mentioned that they felt even better in the game, because they couldn't hear. (pag 58)

Respectful

By learning hearing festival visitors about tactile and visual music, they will get more understanding of what music is for hearing-impaired people. This will create more respectful interactions later on, instead of confused looks.

Surprising

The design is seen as surprising, because it is live. Although an extra surprising element could be added to extend the effect of the design. When more people join this could for example be shown on a bigger screen at the stage, or people would be able to join a simpler version with an app on their phones. This would create an flashmob like surprise element, although the durability of this effects should be further tested.

Tactile & Rhythm

The tactile sense is stimulated by rhythm as the research in this thesis suggested, because of the **intuitiveness** of this element. The rhythm will be followed by the floor, which is noticed by hearing-

impaired to be most natural for them. Although the surface of the vibrating floor could be bigger for bigger dance moves as suggested by Sofie during the expert evaluation phase. This could be considered when further testing the design. By using rhythm as input for the game, rhythmic entrainment can be felt by hearing-impaired and hearing festival visitors.

Visual & Dance

Dance and facial expression are used to stimulate the visual sense, which is the most **intuitive** and emotional visual expression of music. Since emotional contagion is already conveyed via; voice, facial expression and body language, dance is already widely enjoyed by hearing-impaired people.

Easy to follow

An important touchpoint of the concept is simplicity of visual and tactile music. Intuitive and natural behavior should be considered before high tech effects. Often complicated light shows, or complicated beats are used as an extra layer for hearing people. Unfortunately, this makes finding the rhythm and logic in music, difficult for hearing-impaired people. This concept successfully found the bridge between simplicity of tactile and visual music for hearing-impaired and amusement for hearing people.

7.6 Expert evaluation

Because the final test did not include long term hearing-impaired people they were interviewed afterwards. The final concept was presented via a movie (Fig 45), a short explanation and 54, 55 and 56 of this report. Their overall responses were positive, they were especially enthusiastic about seeing other people dance and about incorporation of the vibrating floor.

Sign language coffee bar

During a visit of the sign language coffee bar Gebarista course, three hearing-impaired people were interviewed about their opinion of the final concept of this thesis. Two participants were deaf, who were overall not interested in music. Although they did enjoy dancing and therefore liked the visual and tactile focus of the product. Music from the floor was preferred above music from a bracelet, because floor vibrations feel more natural. One participant became hearing-impaired later in life and still had some memories of ABBA music. She preferred music she knew so she could recognize rhythm. The concept would be nice as an extra, but she is already able to hear music via 'ringleiding'.

"I am not a fan of music, but I do like dancing so I would like to do this."

-Gebarista 1

"The biggest advantage of this would be removing the insecurity of hearing-impaired people who do want to dance, but are afraid to differently to the beat of the music."

-Sofie

Online questionair

Furthermore 8 hearing-impaired who mentioned to be interested in music, were approached via email and whatsapp. These 8 participants were asked to answer several questions about the value of the final concept.

Three of the eight participants replied to some or all of the questions. (Appendix F) All participants were most enthusiastic about the vibrating floor in combination with stimulating dance. Although, one participant mentioned the small surface where people could dance on and would like a bigger space. This participant mentioned to be even more interested in a portable version to play at every location. Overall the design was found interesting mostly because of confidence gathered about dancing on the beat, because of the vibrations. This is interesting, because this was also mentioned by temporary hearing-impaired during the final concept test.

7.7 Recommendations

From the results can be concluded that the overall concept of the final design works, and the design goal is met. Although some elements should be further researched to strengthen the desired interactions. The round shape is designed to create interaction between the participants of the game, but this assumption should be tested, and different shapes should be researched in terms of efficiency of costs and stability. As mentioned in the expert reviews the shape of the floor should also be further tested to be big enough for all dance moves, but not intruding with the festival crowd. Repetition of dance moves of the character could be automatically integrated in the game to make mimicking easier. Furthermore, research should be done in the kind of feedback that participants need and creates most involved. Feedback for bystanders should also be further researched to create more bystander involvement. This could for example be done by giving bystanders the possibility to join the game with a smartphone or other wearable. A smartphone design could also be used as a portable version to make the design independent of a location. Further research could be done to develop the character into a fully automated (sign) dance character. This automated character together with portable vibrations would make hearing-impaired fully independent of their peers at every location in time.

2ND

This section exists because of the complexity of this project. A short design sprint is done to merge the final concept of this thesis into the needs of the Prinsenhof Museum.

LAYER

8.0 MUSEUM EXHIBITION

With the MOJO backstage exhibition, Museum Prinsenhof want to not only show the MOJO festival experience to the average public, but also create a deeper layer into the exhibition that shows current and future developments for deaf people at festivals. Several user groups need to be taken into account when designing this additional layer:

Classic museum visitor

The common visitors of Museum Prinsenhof. For these people the extreme changes in museum context, design and overall experience is already very overwhelming. These people rather do not get in touch with the second layer, because it can give them to many impressions and confuse them.

Hearing festival visitor

Hearing visitors with an interest in music festival experience for deaf people. These people might have visited the MOJO backstage exhibition before or are very familiar with the festival environment and are open to as well as interested in totally new experiences. These visitors first need to get sensitized with the problem, before they are able to understand the solution. For this group the focus is on sensitizing with deaf people in the festival context.

New to music, hearing-impaired

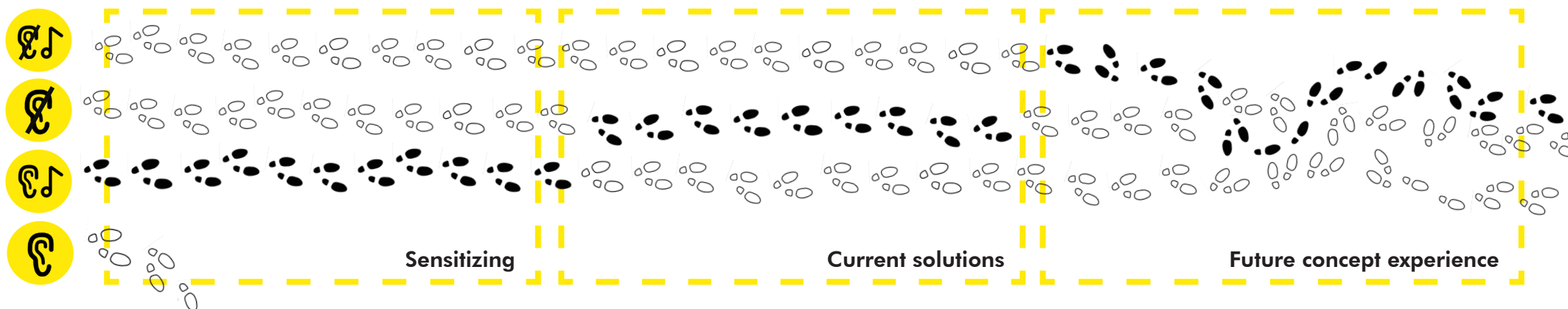
Hearing-impaired visitors who are not interested in music, because they are not familiar with current developments. These people got curious or dragged to the museum, because of friends and family. Some deaf people think music is about sound and therefore

only for hearing people. During the exhibition they can experience that music is about a lot more than sound. Therefore the focus of the route for them is on exploring and experiencing possibilities.

Hearing impaired festival visitor

Hearing-impaired visitors who are well known with music festival experience. Their main goal is to discover new innovations and experience future concepts for deaf people at festivals. The main focus for them will exist of the experience of future concepts, which is also the main focus of this thesis.

Focus of this thesis.



Tabel 1, Visual explanation of the focus areas in the museum for every visitor group. Focus area is presented in bold.

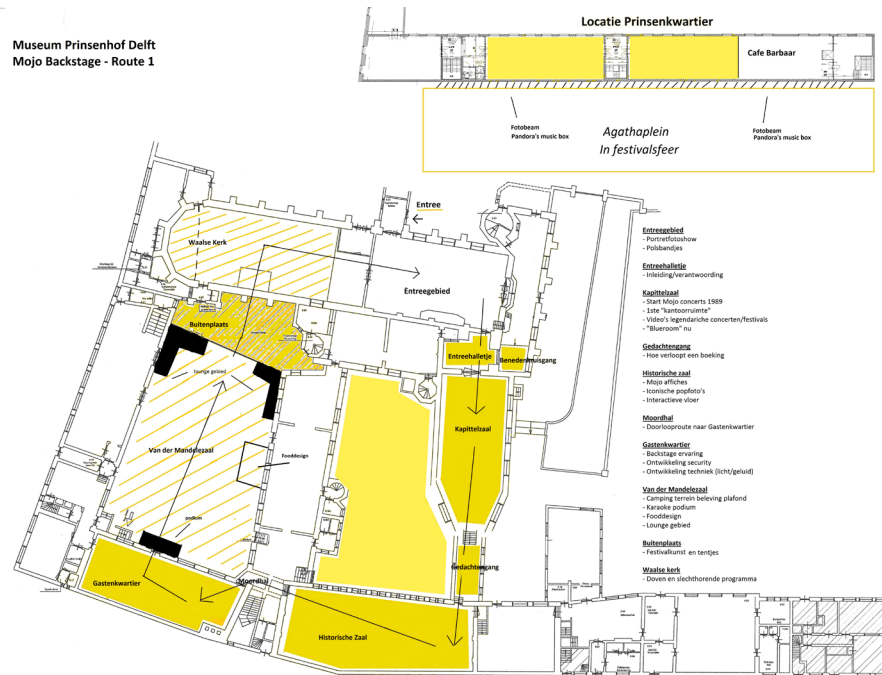


Fig 46. Map of Prinsenhof Museum during the MOJO backstage exhibition.

8.1 Define

Since the final design is exhibited in the museum, the design needs to fit into the museum context as well. Because this is a different context with different stakeholders, a second design goal is needed. This design goal is used to design a concept to link the future festival concept to the museum exhibition. This design goal needs to take all stakeholders and their focusses in the exhibition into account. Therefore, the design goal is:

Design an optional interactive tool that makes users sensitized with the deaf festival experience and experience current and future innovations to enhance the music festival experience for deaf people. The tool cannot intervene with the museum experience of visitors who have not chosen to participate in the deeper layered tour.

Sensitizing

To get hearing people sensitized with the deaf festival experience, an inclusive design method is used. Humans often look at the world and its needs from their own perspective. For example, understanding the experience of being deaf is hard for hearing people because their previous experiences are nothing alike. To create an equal understanding between all users, the interaction will start with sensitizing by experiencing. According to the inclusive design method a person needs to

go through three steps to understand, and possibly design, for a group that the individual does not belong in. (microsoft, 2016)

1) Recognize exclusion

A visitor needs to realize the existence of their biases. In this research this means that they have to let go of their biased image of a deaf person and see that disability is not a personal health condition but a mismatched human interaction.

2) Learn from diversity

Possibilities to increase the music experience are shown by looking into the current innovations at festivals.

3) Solve for one, extend to many

The future possibilities are shown, which include all humans. Since the visitor is now able to empathize with a deaf person, they are able to understand how the future design will benefit for deaf people.

8.2 Develop

At the IO Festival, a yearly festival at the faculty of industrial design engineering, several interaction prototypes were tested with four students. I tested a prototype that would make hearing festival visitors sensitize by experiencing visiting a festival like a deaf person. An installation was made that translated music into touch by putting speakers behind a canvas, while additionally translating music into light by installing a 'disco' light that reacts on the beat of the music. These two elements simulated the light show and the bass that can be felt from the speakers at a mainstream festival. Participants' ears were shielded by letting them wear earplugs and a headphone with white noise over their ears.

Participants were expected not to be able to guess the song and they would start to look around for hints in other people.

Due to loud music around the prototype other participants did not hear the music so the participant was not able to get hints from them, although they did look for hints. Only looking at the lights nobody was able to guess the right song. However, some people were able to guess the right song from feeling, especially when the participant made music themselves or did in the past. I think this might make them more sensible to understanding the different aspects of music like, rhythm, instrumentation or bass. Whether deaf people are able to create this same kind of in-depth music experience knowledge, should be researched in the future.



Headphones with white noise to cancel all surrounding sound.

One question on a sign, answered in sign language on the gopro.

Lights blinking on the beat of the music as visual stimuli.

Boxes behind a canvas as tactile stimuli of the music.

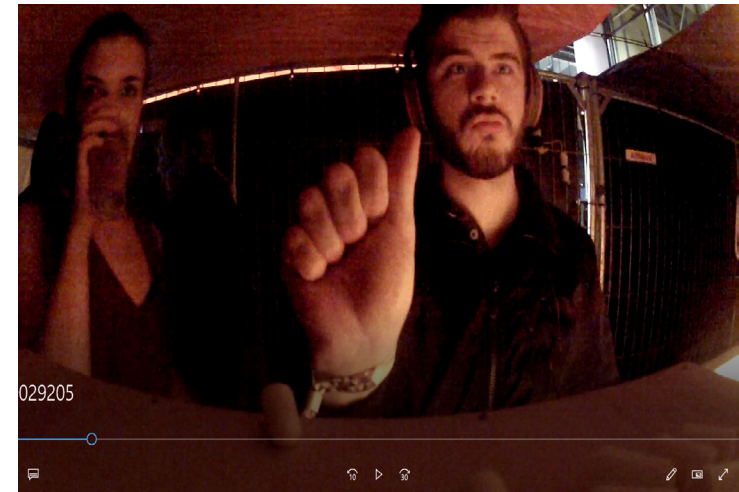


Fig 48. GoPro images of IOF test participants.



8.3 Deliver

Reflection on this last concept resulted in the final concept, in which not only hearing visitors are involved, but also deaf and hearing-impaired visitors. The final concept resulted in the 'music without sound' tour. At the start of the museum visit the visitor can book a tour. This is especially interesting for people who are deaf or hearing-impaired, or for visitors who would like to visit the museum more often. These latter visitors can now walk through the same exhibition twice with an entirely different experience.

8.3.1. Concept explanation

At the start, the participant will get one bracelet and hearing people will additionally receive headphones to close off their hearing. By doing this hearing and deaf people now have the same experience throughout the rest of the exhibition. The bracelet will include a vibration motor and a location sensor. The vibration motor will translate every sound made by museum installations, into vibrations. These vibrations will get more intense when the visitor comes closer to the installation, like sounds would get louder. When the visitor comes close to the installation the location sensor



Fig 49. Design of the haptic tool that leads the visitor through the visual/tactile tour of the museum. (Including hard plate with haptic feedback)

will know where the user is and a light will start blinking in the same color as their bracelet. As soon as they press the button with the light, a fitting current solution will appear or start so the user can experience this. For people who are not experienced with the deaf festival experience it is possible to wait with pressing the button to get the current deaf festival experience without any current interventions. When the visitor walked through the

entire museum they will discover that they can use their bracelet in a final 'game' which is the future concept designed for this thesis. The bracelet will vibrate on the bass of the music and the location tracker will track the motions of the players. When the players do the same movements as the character extra visuals and more intense vibrations will be experienced. For more explanation about this game see chapter 7.1.

EVERYBODY DANCE

A TACTILE/VISUAL MUSIC TOUR FOR HEARING-IMPAIRED

This project is initiated to design include hearing-impaired in the MOJO Backstage exhibition in Museum Prinsenhof Delft. The tour includes current deaf festival experience, existing possible solutions and my own design based on in depth research with hearing-impaired.



VISUAL/TACTILE BRACELET

While this exhibition would normally lead you through sound, this bracelet makes it possible to be led by vibrations. Surrounding beats are translated into vibrations which includes hearing impaired in the entire exhibition.



EXPERIENCE HEARING IMPAIREDNESS

Experience positive and negative sides of being deaf by walking through the museum without any sound. The bracelet will connect and give you extra information at certain points, for example: how do deaf people order drinks?



CURRENT SOLUTIONS

Current solutions are shown and can be experienced for example: Ordering a drink with the hearing impaired drink map of parkpop 2018, video's of sign dancers, tactile music products like subpac or Lofelt, Vibrating floors and even scent and food DJ's can be part of the exhibition.

FUTURE: INCLUSIVE GAMEPLAY WITH EVERYBODY DANCE

When looking at currently available products, enhancing rhythmic entrainment and emotional contagion is mainly done on an individual level. Therefore, in this study a product is designed that uses visual dance and vibrations of bass as the means to create an inclusive interaction between hearing-impaired and hearing visitors.

This is done by an interactive dance game that is played during a live concert. The game is played by mimicking dance moves on the beat, while the beat is felt by vibrations of the bass. As tested during this study the game can be played just as well, as sometimes even better by hearing-impaired people. This creates an inclusive playful interaction by using bass, body movement and facial expression. The body movement and facial expression are even expanded by bystanders who will also imitate the movement of the character and by people in the crowd dancing more actively to be translated into the digital character.



Fig 50. Scenario of the hearing-impaired museum experience.

8.3.2. Scenario

To create an overview of the final solution, a scenario is made. This scenario shows the general experience of a visitor who takes the 'music without sound' tour as well as the different emphasis this tour will have on different visitors who are also described at the start of this chapter. (Visitor 2 and 3, Tabel 1)

8.3.3. Conclusion/ Reflection

Altogether, assuming the interactions work out as designed, the concept succeeded in creating an interactive tool that makes users sensitize with the deaf festival experience and experience current and future innovations to enhance the music festival experience for deaf people. The tool is especially interesting, because it will not disturb other museum visitors by giving quite personal haptic feedback to the user. This concept needs further development, since this was a second layer within this thesis there was no time to do additional test. Testing needs to be done with the deaf and hearing-impaired target group to create the desired, respectful and intuitive experience for them. This concept can be further developed after this thesis in collaboration with the museum. The tool could be used also in other exhibitions to replace attention grabbing by sound in museums by

8.4 Feasibility

8.4.1. Time plan

The best way to reach as many deaf and hearing-impaired people as possible with this exhibition is via facebook. During this thesis I discovered this is the most used medium for this target group. facebook groups involved are DEAFGAIN, jong en slechthorend zuid nl, muziektolkhoorterbij, etc. It is also interesting to approach SH-jong, an organization especially for young adults who are hearing-impaired. They are also in close contact with muziektolkhoorterbij and Sencity.

8.4.2. Partners

To realize this project a few partners, need to be considered as collaborators with the museum:

- The final future concept can be realized by a software developer and a visual artist.
- The vibrating tool can be realized by Lofelt as they have very precise vibration technologies that can also get the intention of music, instead of a simple vibration motor used by an alternative as Arduino. The Lofelt bracelet could be attached to the microphone on a smartphone which does mean that the visitor needs to walk around with his/her phone in their hands or at least their microphone needs to be open to surrounding sounds.
- '6Dcreations' can be used as a partner for all currently available products for deaf people at festivals like Sencity and Mutesounds. For these you can think of: Scentjockeys, a sensefloor,

foodjockeys, textjockeys, scents and color lab, etc.

8.4.3. Costs

A low budget variety of the original concept is used in the museum, where the main interaction is still similar to the designed interaction. Although this low budget variety creates a less playful interaction and is less huffer proof and therefore not suitable for festivals.

4000,-	Game development
400,-	Animator dance movies
400,-	Song usage rights
1000,-	Beamer screen including kinect
1500,-	Lofelt bracelets (10x)
1000,-	Development Lofelt connection to microphone.
100,-	Noise cancelling headphones (10x)
3000,-	Other tour element research and Design.
<u>10800,-</u>	

a rough cost estimation of 11.000,- for the entire development and realisation of the tactile/visual tour of the museum design.

To save costs it is recommended to work together with companies by making a deal where their product gets known and the museum can exhibit/use their product for free. For example with 'Lofelt' and/or sign dance performers.

REFLE

CTION

9.0 REFLECTION

The project goals and personal ambitions set at the start of this thesis are mostly succeeded and learning goals are reached. All separate learning goals will be discussed in this chapter.

Having deaf and hearing-impaired people as a target group made me not only research another culture, but also made commonly used methods like interviewing more difficult. Even simple contact like calling was not a possibility, which made contact go slower than desired. During this project I learned how to use methods that are more applicable to use when struggling with this language barrier. I also learned how to make small changes to existing methods to fit them to the situation. Another difficulty that came with this target group, was that they were very difficult to reach. The Dutch deaf festival community is not large and therefore it was difficult to find these people. I learned that is important to know the right people, like for example the sign dance community who knew to which festivals deaf people were going. Trying to reach the right target group took up time which often finished at a dead end. Although that did teach me to try and reach people in as many ways as possible and to not be afraid of getting a 'no' or even no reply at all, instead just being grateful for a reply.

I wanted to reach this target groups to find differences and similarities between them. During this process I picked up some literature from the 'Inclusive design' lecture which turned out to be very useful for this assignment. I realized that every design project is different and needs a different approach. Often existing methods can be used to create a suitable method for a project. These methods can be earlier used methods, but also keeping up to date with new models and theories is useful, especially in very different projects than usually practiced.

Prototypes have always been a preferable way for me to test interaction or even as a tool during interviewing. Therefore, creating several prototypes (High and Low fidelity) was one of the goals of this thesis. Because of the number of tests I wanted to do, I found it more productive to focus on low fidelity prototyping for this thesis. Even tough, I do think that appearance and technical specs of a product are important, the design goal of this thesis is focused on the interaction that is evoked by the design. In an individual design process like this thesis it is important to be efficient and therefore I chose to do several short sprints of testing with a non-time-consuming prototype, instead of creating one prototype, more similar to the real design, but with a less tested interaction. Overall, I think this adjustment was suitable for this thesis, although

I am still interested in making a high-fidelity prototype together with a bigger design team.

Partner management was often difficult during this process. I learned it is important to state all wants and needs of all partners clearly at the beginning of a project. Although this sounds obvious many changes with partners were made last minute, which can have big impact on the schedule of a short individual project like this thesis. Also, the approach of this exhibition is new for all partners, causing a lot of changes in budget, scheduling and wants and needs. During the project desires of the museum had changed and added on top of the graduation assignment, which taught me to be clear about my own goals as well.

Because of the complexity of partners involved the structure of the design was also complex. Designing for a partner that is recreating a context of somebody else, created a double layer. This double layer included: double context, double target groups and double goals. At the start of the project I did not see this as a barrier yet, although further on in the project I discovered I needed to split both layers and see them as two separate design cycles, with one as a focus design cycle and the other to link both contexts.

Personal ambitions

On top of project goals, I also stated personal ambitions for this project, which were not directly linked to the project brief but learning goals I wanted to reach within the graduation course.

First, I desired to put emphasis on the DFI master specific elements of the project. I therefore wanted a project that was able to influence behavior and design impactful innovations. I believe I achieved this by choosing a target group and lifestyle that the average audience does not know. With the design I can impact them by another perspective on music and even a different perspective into language and culture.

Second, I wanted to use knowledge gained during elective courses like culture sensitive design and lighting design. Both courses were very useful for this project, because of certain methods like socio-cultural dimensions and prototyping. It was interesting to see how the theory of these courses can be used during a bigger design process in combination with other methods.

Third I wanted to do interaction testing which I successfully managed to do during IOFestival, Down the rabbit hole festival/ Lowlands and the

final interaction test of this thesis. Interaction testing is a method I believe is extremely useful and therefore I enjoy doing it. These interaction tests and other appointments I had with the target group, also made me stay on schedule, since I created deadlines and promises to other people. I learned that this is a method to keep me constantly progressing while enjoying the process. Within the timespan I was not able to create a more detailed prototype, although I learned that making use of partners like Lofelt, can create similar interactions and save time in prototyping.

Fourth, multisensory design inspired me and I wanted to learn more about this subject. During this process I got to know this subject by researching it in the field as well as via literature. For example, I got to know several interesting designs by visiting deaf inspired festival like Sencity or via other contacts. While I also got to know more of the theory behind for example tactile, visual and audio feedback via literature research. This field is very large and for this project I focused on multisensory music theory. For future research and design projects I would also like to look into other multisensory fields, or find fields myself where multisensory design can enlarge current experiences.

Overall, I especially learned from designing for this target group, both in a positive and negative way. Overall the target group inspired me to think about design from a multisensory point of view, or better set, from a viewpoint of missing one sense. Being a designer in the current time is extremely interesting, because we get to think about the experience of a product instead of only their specs. For me, the experience of many products currently on the market can enrich largely by taking multisensory design into account. Especially when we look into an enormous online, screen based market with endless possibilities, although mainly focused on visual feedback to the end user. Through this project I learned that multisensory design can be very inspiring and open possibilities, when envisioning a world without one of those senses.

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APP P

ENDIX

APPENDIX A, Context mapping session

This appendix consists of three pieces of the sensitizing material that Maria brought to the context mapping session and all collages the participants made during the session. The sensitizing material and poster is used for deeper conversations about past, future and current values about the context of music festivals. (Sanders & Stappers, 2012) The most important quotes and my interpretation of these quotes are noted in transcriptions, which can also be read in this appendix.



Fig 52. Maria and Clarissa working on their collages during the context mapping session.



Fig 53. Sensitizing material of Maria. Including from left to right: a news article about Maria's experience in a deaf choir, Maria dancing during a festival, Maria dancing on the rhythm of the drums in an african dance class.

Naam: Maria Ong

- waterorgel met verschillende notenkleurres
- blaasorgel
- ik wil gewoon open, niet gesloten

- gebarencode
- dansen (vlot niet maar)
- gewoon leven, vrolijk
- leuke liedjes

Verleden

op school leren met muziek omgaan moesten de drie kinderen als vrienden leven. gesloten, voel mezelf niet



→ beter open, krijg angstig en benauwd



lekker aanvoelen met de wind

Mijn huidige concert ervaring

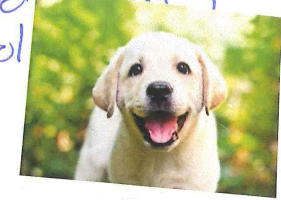


→ heerlijk



altijd lach

→ positief



lekker aanvoelen



meewerkende noten leren.



wil proberen Toekomst



Kan ik niet problemen met overwichtig

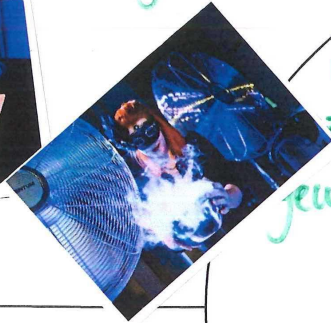


NIEMAND KAN MIJ tegenhouden, zoals ik ben

Naam: Clarissa

Muziek brengt allerlei verschillende mensen samen.

Bezoek Sencity! Festival ook voor doven en slechthorenden, gebruik van alle zintuigen. Muziektolk aanwezig, trildvloer, geuren.



- Iedereen gehoorbescherming
- Standaard muziektolk zodat het voor iedereen toegankelijk is

Heel veel concerten zoeken, sfeer is altijd geweldig!

Mijn huidige concert ervaring

Enige nadeel: oor suizen meteen na het concert en dag erna.
Tegenwoordig altijd oordoppen in

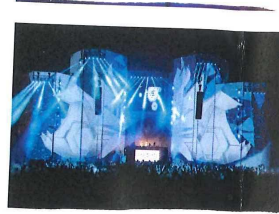
Verleden

Toekomst

Lange wachttijden, lijkt wel alsof artiesten denken dat ze beter zijn omdat ze bekend zijn.

Naam:

+



Grote podia
licht installaties
vooral vrienden
van vrienden
extra laag



Ruimte
natuur
vrij ademen
meer
nieuwe
technologieën

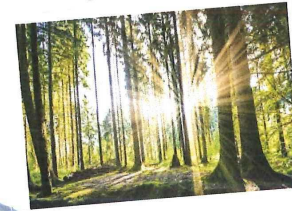
vette snacks die tegen vallen



moet op de
muziek kunnen
dansen



Nieuwe vrienden
maken/hechten met
oude
vrienden



om de festival
ervaring te
veranderen

Verleden

Mijn huidige
CONCERT/festival ervaring

Toekomst



afhankelijk van
het weer



verwarpende
kaarten

→ niet genoeg
kan je alsnog niemand
vinden



druk

ik zie alleen maar
Ruggen



kinderlijk
geeft sfeer



interactieve licht
vloer
verrassend
element

Transcriptions of context mapping interviews

Maria (Doof)

Quote: Muziek, kan ik wel voelen. De beat. Dat lukt me wel. Maar dan mee dansen, dat lukt niet. Een keer had ik mijn hand op een box, toen ging het wel.

Paraphrase: Ritme komt van binnenin. Als het een keer gezien/ gevoeld wordt kan het daarna worden herhaald van binnen.

Quote: In de kleedkamer, na de dansles, vroeg een vrouw aan mij, ze begon te praten en ik zei: ik kan het niet volgen, want ik ben doof. Toen zei ze: je bent doof?! Hoe kun je dansen?

Ik zei: dat gaat vanzelf, dat zit in mij, vanbinnen. Zo mooi!

En hier zie je het ook, streetdance.

Paraphrase: Ritme komt van binnenin. Als het een keer gezien/ gevoeld wordt kan het daarna worden herhaald van binnen.

Quote: Het is hard, dan voel je het, lekker gevoel. Je ziet de mensen dansen, zo mooi!

Bloos, boos, blij, vrolijk. Je ziet het allemaal.

Paraphrase: Emoties van anderen zijn belangrijk voor de interpretatie van muziek voor doven.

Quote: dit is een student, hoe doven en horenden samen moeten. 2 vogels op één tak.

Ik hoor dus geen muziek, ik heb tegen haar gezegd: heb je een ballon? Die had ze, opgeblazen, en dan kan ik wel de muziek voelen. Heel duidelijk. Die beweegt dan op het ritme, dat voel ik.

Paraphrase: Door een ballon vast te houden kan het ritme gevoeld worden.

Quote: Want ik kan het niet horen, dus ik moet wel kijken en blijven kijken.

Paraphrase: Ritme kan visueel gevolgd worden, door naar iemand anders te kijken.

Quote: ja, ik heb het op een feestje meegemaakt, een ballon meegenomen. Iedereen kijken! Boeiend haha.

Paraphrase: Een voorwerp als een ballon kan doven helpen de muziek te volgen, maar kan hun ook anders maken dan de rest.

Quote: toen mijn vriendin 40 was, was er feest. Zij waren er ook. Het was echt een heel fijn gevoel, dat ze aan het blazen waren. Dat kon o ik voelen in mijn buik! Echt heerlijk.

Paraphrase: diggerydoo kan gevolgd worden door de harde trillingen over de vloer naar een buikgevoel van de doven.

Quote: Voor mij is het moeilijk als er 2 groepen zijn, dat ze verschillende dingen moeten doen. Waar moet ik dan kijken?

Paraphrase: Er kan maar op een visueel aspect tegelijkertijd gefocust worden.

Quote: Er was een ander meisje die tegen mij moest zeggen als we op moesten staan, want dat hoor ik niet. Maar ja, ik wilde het eigenlijk zelf doen. Haha

Paraphrase: Ze wil graag zelfstandig zijn, ook als het om dansen gaat.

Quote: In het begin moeten we het liedjes leren. Er is een wit scherm, daar komen filmpjes op, de muziek met de ondertiteling. Er zijn dirigenten, horenden, die gebaren het liedje. En wij volgen haar dan. Wel met de muziek erbij. Maar ja, ik hoor de muziek niet. Je kunt wel op het ritme mee doen, dan de gebaren erbij doen.

Paraphrase: Om een liedje te leren is text, ritme en gebarentaal nodig.

Quote: nee, het is engels vertaald naar het nederlands en dan de gebaren. Dat is makkelijker om op te nemen, dan uit te beelden met gebaren.

Paraphrase: Doven kunnen vaak niet goed engels

Quote: Ik hoor wel muziek, maar ik weet niet of het mooi is of niet, door jouw gebaren wel! Zie ik het!

Veel mooier!

Paraphrase: Een Cochlear implantaat zorgt ervoor dat een doven iets kunnen horen, maar het verschil ligt erg ver uit elkaar. Vaak komt het erop neer dat ze wel kunnen horen dat er muziek is en dat er mensen praten, maar het niet kunnen volgen of de muziek zouden herkennen. Soms word ritme gehoord, soms niet.

Quote: ringleiding, dat... Hij luistert naar één bepaald geluid, kan niet alles horen. Hij focust op één geluid. Zonder ringleiding is er te veel geluid. Thuis heb ik ook ringleiding. Als ik dan een film kijk, doe ik de ringleiding aan. Dat gebruik ik thuis wel, een klein apparaat.

Paraphrase: Een ringleiding is nodig om het geluid te focussen. (Is dit er bij concerten?)

Quote: Mijn gebaren naam is ook butterfly.

Paraphrase: Personen verzinnen vaak zelf hun gebaren naam. Een gebaar dat ze zelf bedenken.

Quote: Op school leren met muziek omgaan moesten de dove kinderen als horenden leren. Gesloten, voel mezelf niet.

Paraphrase: Doof zijn is een andere cultuur en levenswijze dan horend zijn en dit moet gerespecteerd worden.

Clarissa (Schrijftolk & Student gebarentolk)

Quote: Muziek brengt allerlei verschillende mensen samen

Paraphrase: Muziek brengt mensen samen.

Quote: Er zijn vaak lange wachttijden bij concerten.

Paraphrase: Tijdens de wachttijden kan er interactie met anderen plaatsvinden

Quote: Iedereen draagt tegenwoordig gehoorbescherming. Ik ook.

Paraphrase: Mensen geven steeds meer om hun gehoor.

Quote: Ik zou graag willen dat er standaard een muziektolk bij ieder concert was, zodat het voor iedereen toegankelijk is.

Paraphrase: Door een muziektolk wordt elk concert/festival toegankelijk voor doven en slechthorenden.

Maartje (Horend)

Quote: Owja en het is altijd ontzettend druk en daardoor kun je alsnog niemand vinden. Als iedereen steeds op dezelfde plek blijft dan is er altijd een podium dat heel druk is

Paraphrase: Drukke wordt als negatief ervaren op een festival omdat mensen kwijt raken.

quote:
Als er ook echte instrumenten gebruikt worden vind ik het waardevoller dat dat dan echt is ipv dat het van een dj komt.

Paraphrase: drukte wordt ook als vervelend ervaren omdat er het podium niet gezien wordt. Het wordt als belangrijk ervaren om te zien waar het geluid vandaan komt.

Quote:
En dat je nog een beetje de muziek hoort ipv de beat. In bepaalde hoeken hoor je alleen de beat.

Paraphrase: Soms is het niet mogelijk om de volledige muziek te horen. Alleen hoge of alleen lage tonen.

Quote:
Je bent ook met je vrienden. Het gaat niet alleen maar om de muziek, dus ja ik zou wel een gesprek willen hebben.

Paraphrase: Een festival draait voor veel ook om de sfeer en niet alleen om de muziek.

Quote: Je kan niet echt diepgaande gesprekken hebben met mensen die je niet kent.

Paraphrase: Maartje is niet geneigd om met vreemden diepe gesprekken te hebben.

Quote: Het is gewoon gezellig samen en je raakt in gesprek. Vooral als er een overeenkomstige interesse is dan heb je de tijd om je eigen ding te doen om met iemand te praten. Niet zo geforceerd.

Paraphrase: De interactie met anderen moet niet geforceerd aanvoelen. Een gemeenschappelijke interesse kan dit voorkomen.

Quote: Ik denk dat ik mn mobiel erbij zou pakken. Want je kan toch heel veel mensen niet echt goed verstaan dus weglopen naar een stillere plaats heeft geen zin. Dus ik denk dat ik mn mobiel erbij zou pakken. Maar ik weet niet hoelang dat zou lukken.

Paraphrase: maartje zou een korte interactie met een doven aangaan als het onverwachts was en als het vrienden van vrienden zijn. Dit zou ze doen via haar telefoon door te typen.

Quote: Nou dat ligt eraan. Als ik van te voren zou weten dat de persoon doof was zou ik er niet aan beginnen. Maar als je dan toch al per ongeluk in een interactie zit ja dan zou ik.

Paraphrase: maartje zou een korte interactie met een doven aangaan als het onverwachts was en als het vrienden van vrienden zijn. Dit zou ze doen via haar telefoon door te typen.

Quote: Het is meer dat als je bewust een doof persoon aanspreekt en je pakt niet gelijk je mobiel erbij. Dat is een beetje onhandig.

Paraphrase: maartje zou een korte interactie met een doven aangaan als het onverwachts was en als het vrienden van vrienden zijn. Dit zou ze doen via haar telefoon door te typen

Quote: Je hebt ook nog dat element dat je in het algemeen sws niet zo heel snel met vreemden in gesprek raakt.

Paraphrase: Maartje is niet geneigd om met vreemden diepe gesprekken te hebben.

Quote: Maar kijk als nou een vriend een doof persoon mee zou nemen. Zou ik daar wel mee proberen te communiceren want ik vind het wel hartstikke interessant, maar dat is hetzelfde als andere culturen die stel ik ook allemaal vragen.

Paraphrase: maartje zou een korte interactie met een doven aangaan als het onverwachts was en als het vrienden van vrienden zijn. Dit zou ze doen via haar telefoon door te typen

Quote: ja dus als vrienden van vrienden doof zouden zijn zou ik daar wel een gesprek mee beginnen.

Paraphrase: maartje zou een korte interactie met een doven aangaan als het onverwachts was en als het vrienden van vrienden zijn. Dit zou ze doen via haar telefoon door te typen

Quote: Dus ik kies niet een, ja een concert wel, maar een festival kies ik niet uit op de muziek

maar meer om miss wie er gaan of dat ze dingen eromheen maken. Onverwachte gekke dingen. Dat vind ik het wel bijzonder maken.

Paraphrase: Een festival wordt meer gekozen voor de extra laag en een concert eerder om de muziek.

Quote: Hoewel dit wel heel cool is vind ik dat er nog wel meer 3d mag. Ik vind wel dat er nog wat achter je mag gebeuren opeens ofzo.

Paraphrase: Maartje zou ook graag meer extra effecten willen tijdens een concert.

Quote: Extra verrassend element. Dat Dat een lichtvloer is die op je reageerd. Alleen licht zou me teleurstellen, of dat het met muziek licht wordt. Ik denk dat dat ook het verschil gaat maken tussen festivals.

Paraphrase: Verrassende elementen maken een festival voor de toekomst



Fig 54. Jessica van de Waard during a performance for hearing-impaired people.

Interview Jessica van de Waard

Jessica is a Muziektolk/ Signdancer for the association 'Muziektolk hoort erbij'. She became hearing-impaired herself and enjoys sign dancing at several festivals. She tells me that taking sign dancers at big festivals like the ones of MOJO is very difficult, because they need to let the interpreter in and give them a high spot somewhere close to the stage. She explains me that the english songs are mainly translated in Dutch sign language, because deaf people don't learn english very often. Like I also noticed at Sencity, she tells me that sign dancing is about movement, facial expression and hand gestures.

APPENDIX B, Sensitizing experience



Fig 55. Experiencing a live concert while hearing only white noise at Down the Rabbit Hole.

To experience deafness at a festival myself, I walked around for an hour at a festival with white noise noise cancelling earplugs and headphones. Before the experience I made mind maps about my preconceptions to compare them with my insights afterwards. One mind map about what deaf can do at a festival and one about what they can't do at a festival Afterwards I wrote down my insights and compared them to the preconception mind maps. Insights I did not expect or are different than I expected where noted and discussed below:

- Songtext: I did expect I was not able to hear songtext, but especially missing the emotion and purity put into the voice was a pity.
- Bass: I expected the bass to be easier to feel. I really had to stand still to feel it from the speakers.
- Floor: Although the speaker bass was not felt as expected, when other people started to jump I immediately got the rhythm through the vibrations in the wooden floor. Even if somebody next to me was just tapping on the floor with their feet, I could feel the rhythm very well.
- Hand gestures: I expected dancing, but I never saw a pattern in this. At one of the shows I

discovered that feet and jumping is mostly on the lower frequencies and hand movements and fingers on the higher melodies.

- Ordering: ordering drinks or food is very difficult, which was also expected. Although in this case it was different, because I was visually deaf because of the headphones so the employees knew I was different and couldn't hear.
- Spontaneous talk: Since I am a big fan of getting to know new people at festivals I was very disappointed about this missing factor. Other festival visitors looked at me, because of the headphones, but nobody talked to me. I also didn't want to start talking to them because I didn't want to seem silly.

APPENDIX C, Doof kind review

The documentary 'Doof Kind' shows that being deaf is a culture and not a handicap. Deaf people are proud of their culture and on who they are. Deaf people are often misunderstood and in history seen as handicapped by hearing people or governments. Seeing the interviews in this documentary shows the importance of giving deaf the possibility to speak their own language, in which they don't have a backlog on hearing, but they are just the same. Nowadays young deaf people who grew up in a deaf community are proud on their culture and who they are. The main character in this film, Tobias, has been to Lowlands several times. In the documentary and interviews he mentions that he can feel the beats of the music and that the 'empty' spots in front of the speakers are a perfect meeting spot for deaf people. Apart from being proud he also mentions that hearing people who have never been in contact with a deaf person can sometimes be scared, while people who know a more about deaf culture just write something down or articulate bigger.



Fig 56. Screenshot from the documentary 'Doof Kind', where Tobias signs 'deaf power' and his Lowlands bracelets become clearly visible.

APPENDIX D, Interview Flora Koene



Fig 57. Flora Koene at her workspace after the interview. An abstract composition of visual music she made earlier is presented on the screen.

Flora Koene did an interview at Sencity about visual and tactile music which inspired me to talk to her personally afterwards. Flora Koene is a graduate at the conservatorium Amsterdam, with a master research into visual and tactile music. She invited me to her house and showed me movies and prototypes she made for her master thesis. The interview brought me several insights:

- Rhythm is the most intuitive part of music. Representing music by movement in body and face is more valuable than abstract ways like moving blocks or colours.
- Deaf poems or music has rhyme and wordplay, this is done by using movement of the body. (Wim Emmerik)
- Facial expression and body language are part of sign language and can also be used during music without text.
- It is important to understand deaf culture, before designing for them. At places like Sveda (Stichting welzijn doven amsterdam) it is possible to experience deaf culture. For example in Deaf culture it is more normal to touch each other.
- Hearing-impaired is a big spectrum of people and it is most interesting to find a way to get inclusive design to address them all.

APPENDIX E, Interview Down the rabbit hole

This appendix includes some of the more interesting quotes of interviewees during the down the rabbit hole festival. these quotes are used as foundation of redesign cycles towards the final concept.

'I saw two people signing to each other at the concert yesterday. So interesting, but what are they doing at a festival?'

Sam

'I am used to listen with my ears and not with my haptic sense so I can't find the details in this'

Man 1

'I miss the melody in the music. The melody makes the music for me.'

Man 1

'Yesterday we saw a man with a whiteboard and a marker. He wrote on it that my friend was wearing weird pants in dutch and afterwards he wrote something in italian, very misspelled. These messages were very direct, but also funny.'

Daniella

'We had one lesson of sign language in high school. I only remember some animals. This is turtle. *signs turtle*. If I would meet a deaf person I would show this and then get my phone.'

Girl 2

'I mainly meet friends of friends'

Girl 2

'At a festival you are not really talking to strangers, you are mainly doing. Yesterday we were just climbing on a rubber band and the only thing we said to the others was yeaaaaayyy.'

Girl 1

'Because I am belgian I think I am less eager to talk to strangers than the dutch, but at a festival there are so many people that it is so easy to have a little conversation.'

Charlotte

'I meet new people in line, waiting for my favorite artist, getting food or when washing my hands'

Girl 1

'I mainly meet new people in line.'

Orlando

'We saw somebody with a free hugs sign yesterday. He got a lot of hugs. A festival is a free space where people want to be silly'

Girl 3

APPENDIX F, Expert evaluation



Fig 58. A Deaf and Hearing-impaired gebarista who gave feedback about the final concept.

Sofie Helleman

Wat denk je dat dit concept voor jou voor voordelen met zich mee brengt?

Het grootste voordeel zal vooral te maken hebben met het weghalen van de onzekerheid van dove en slechthorende mensen die wél willen meedansen, maar die dat niet zo goed durven omdat ze bang zijn dat ze 'afwijkend' dansen op de beat of de muziek.

Wat denk je dat dit concept voor jou voor nadelen met zich mee brengt?

Het nadeel is dat je gebonden bent aan een vaste locatie. Als je bijvoorbeeld bij Zwarte Cross bent of Lowlands, kun je niet zomaar even ergens anders gaan staan of luisteren/voelen. Dit kan ervoor zorgen dat je 'gedwongen' voelt te moeten blijven op een plek waar je

de muziek bijvoorbeeld niet geweldig leuk vindt.

Zou je mee doen aan een spel als dit? (waarom wel of niet)

Mocht ik ze tegenkomen, dan zou ik denk ik wel een poging wagen. Echter ben ik van 'nature' al een danser (ik ben met dansen begonnen toen ik 7 jaar was en bleef

tot mijn 25ste dansen (ballet). En nog steeds vind ik dansen heerlijk). Dus: JA, omdat ik het grappig zou vinden en het wel zou willen ervaren hoe het is. NEE, omdat ik vaak de muziek en de beat vanuit mezelf laat leiden.

Wat vind jij vernieuwend aan dit concept?

Je koppelt live-muziek aan de dansplaat terwijl er geen trilvloer is. Daarnaast laat je bewegingen zien als animatie, wat het ook vrolijk maakt naar mijn idee.

Wat zou jij anders willen zien aan dit concept?

Als ik kijk naar de nadelen (die ik bij vraag twee heb benoemd), dan zou ik zeggen: Kijk eens of je deze vorm kunt gieten in een soort armband, een soort digitale horloge maar dan speciaal voor dans en muziek.

Als ik kijk naar het filmpje, dan valt mij één ding gelijk op: er is nauwelijks beweegruiimte voor je voeten. Als ik dans, heb ik mijn voeten zo nu en dan ook wijd. Maak daar meer ruimte voor. Mocht ik ze zelf willen gebruiken, dan zou ik het fijn vinden als ik in ieder geval naar voren/naar achteren/ en beide kanten opzij genoeg ruimte heb om een beetje mee te stappen. Dus dan zou ik denken aan een vierkant of rechthoekige vorm van minimaal 1 meter, misschien wel 1,5 meter.

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