Appendix

A. Design Brief

B. Traditional EEG Test Procedure

C. Context Mapping Flyer / Booklet / Notes

D. Patient Journeys

E. Booklet & Feedback from Ideation

F. Evaluating Concept Usage & Time Feedback from Healthcare Providers

G. Technology comparisons

H. Exploration of Virtual Elements

I. Exploration of Physical Pieces

J. Evaluation with Experts - Booklet & Set up

K. Evaluation with Students

L. Evaluation with Child-Patients & Parents - Set up

M. Evaluation with Child-Patients & Parents - Notes & Results

N. Consent Forms [redacted]

Appendix A

Design Brief

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Ekhtiar
initials: T given name: Tina
student number: XXX
street & no.: XXX
zipcode & city: XXX
country: XXX
phone: XXX
email: XXX

Your master programme (only select the options that apply to you):

IDE master(s): ★ IPD ○ DfI ○ SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ○ Honours Programme Master
specialisation / annotation: ○ Medisign ○ Tech. in Sustainable Design ○ Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: dept. / section: ID-DCC
** mentor: Lyè Goto dept. / section: ID-AED
2nd mentor: Marie-Claire de Wit
organisation: Erasmus MC Sophia Children ' s Hospital
city: Rotterdam country: The Netherlands

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Mathieu Gielen date 18 - 03 - 2020 signature Digitaal ondertekend door Mathieu Gielen Datum: 2020.03.18 16:38:31 +01'00'

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 30 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 30 EC

List of electives obtained before the third semester without approval of the BoE

[x] YES all 1st year master courses passed

[ ] NO missing 1st year master courses are:

name date 23-3-2020 signature

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: [x] APPROVED [ ] NOT APPROVED

Procedure: [x] APPROVED [ ] NOT APPROVED

comments

name Monique von Morgen date 30-3-2020 signature MvM

Initials & Name T Ekhtiar Student number 4811720

Title of Project Enhancing Curiosity to Create a Child-Centered EEG Experience

Enhancing Curiosity to Create a Child-Centered EEG Experience project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 18 - 02 - 2020 21 - 07 - 2020 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Sophia Children ' s Hospital Child Brain Lab is looking to improve child-patient care by taking the patient ' s perspective in an innovative new care space. This project is in collaboration with the physicians of the Sophia Children ' s Hospital Child Brain Lab and the Play Well Lab at the TU Delft. The Child Brain Lab (CBL) will be a new space to do pediatric brain testing, a room with several different stations, such as electroencephalogram (EEG) and gait analysis. Children visiting the lab have different brain disorders, such as epilepsy or with varying neurological or behavioural developmental levels. This project is centered around creating a child-centered EEG station experience at the CBL for children of the developmental ages of 6-12. The EEG station is one project for the CBL and there are two other graduation projects related to improving child-patient care at the CBL.

Sophia Children ' s Hospital CBL is implementing value-based healthcare in their new care space. Value-based healthcare takes the patient ' s perspective, increasing value for the patient by focusing on areas where patient ' s health and experience can be improved while keeping costs minimal [1].

The goal of the hospital for the CBL is to create a space to do repeatable brain testing of children of various ages and disorders in order to do clinical diagnosis patients and to use the research to learn more about cross diagnosis and treatments of different disorders. The hospital envisions a space that is welcoming to the various patients that will visit the CBL and enhance patient understanding to improve patient care. This project looks from the child-patient ' s point of view to improve the comfort, understanding, and experience while getting an EEG test. An assumption journey of the child-patient ' s experience is presented in Fig 1 and identifies key areas where patients experience confusion or anxiousness.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: Assumption journey map of patient's experience getting an EEG test. [2][3]

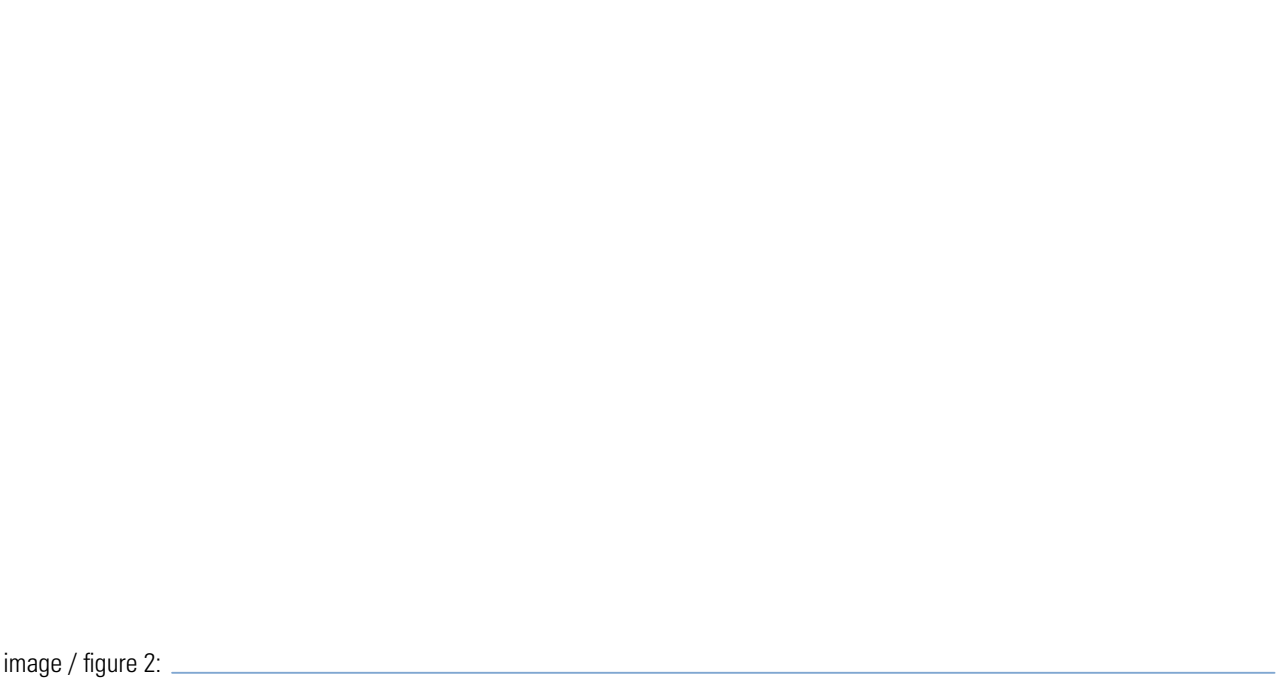


image / figure 2:

Initials & Name T Ekhtiar Student number 4811720

Title of Project Enhancing Curiosity to Create a Child-Centered EEG Experience

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

In creating a child-patient centered EEG testing experience that delivers on value-based healthcare principles, several problem areas are encountered that relate to child anxiety, communication with children, the variety of cognitive and physical abilities of the patient group, parent involvement and feasibility for hospital staff. Child-patients are often anxious and apprehensive about doing EEG tests as it is confusing and the results are given in a form that is not digestible to them. Anxiety can increase during periods of waiting and times of boredom, where the patient's mind has time to wander [4]. After the EEG test, patients are relieved that the test is not painful, but still don ' t understand it.
Children fill gaps in knowledge with their own wild assumptions which can cause more anxiety. A co-creation session showed that children thought that the EEG would suck the thoughts out of their head [5]. At the same time, children are also curious about what is happening and these moments are opportunity areas for learning. In hospital settings, children often are found to have a passive role as parents and doctors communicate with one another [6]. Peer to peer communication can be a useful tool for explaining things to child-patients as there is a level of understanding and trust between children [5]. The project aims to be inclusive of the different kinds of children that will visit the CBL, such as brain and behavioural developmental disorders. Flexibility in treatment for individual needs can have a large impact on patient care [4].
Sometimes patient behaviour is hard to identify as a healthcare provider, especially for patients with lower developmental levels. Parents are experts in their child ' s behaviour and know the baseline of the child-patient ' s mood, for example how anxious a child is normally [4]. Parents' mood also has a large effect on the child, if parents are anxious, the anxiety can be reflected in the child [7]. These factors make the parental interaction important to account. The EEG station needs to fit into the workflow of the lab technicians, should not add significant workload or inhibit performing tasks. The EEG station should consider interactions moments in which the specialist can help the child learn about the EEG test

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

Design a child-centered EEG testing station by changing moments of boredom and anxiety and enhancing moments of curiosity to improve the patient experience at the Child Brain Lab. Facilitate the parent and specialist interactions with the child-patient to reassure the child-patient during the EEG testing experience. Possibly utilize peer to peer communication to improve in patient comfort and understanding.

Research Questions

What are moments during the EEG testing that the child-patient experiences boredom, anxiety, and curiosity?
When are moments that the child-patient ' s need comfort or reassurance from their peers, parents, or specialists?
What are ways to create an inclusive testing station for the variety of patients visiting the Child Brain Lab?
How to provide patients information about the EEG test by utilizing their own curiosity in an understandable and playful way?

In order to answer the research questions and address the stakeholders ' needs, interviews will be conducted with child-patients, parents, and the healthcare providers. With this information, a journey map will be developed from the patient ' s perspective to identify key moments of boredom, anxiety, and curiosity that can be used as intervention points to make the experience less confusing and more understandable. Then by utilizing co-creation and testing sessions, a concept will be developed for the EEG station. The EEG station should fit into the workflow of the lab technician and not hinder tasks that they need to complete. The station should also take into account parent ' s interactions with the child and

Initials & Name T Ekhtiar Student number 4811720

Title of Project Enhancing Curiosity to Create a Child-Centered EEG Experience

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 18 - 2 - 2020 21 - 7 - 2020 end date

The planning of the project follows the double diamond method [8], an initial problem scope and after the Research phase, a redefined on the problem definition. The observational research and interviews will lead to journey mapping, focusing on key moments of boredom, anxiety, and curiosity of the patient and looking into their interactions with the other stakeholders, the hospital specialists and the caregivers. During the Research phase, ideation will be done side by side to capture initial ideas. After the research phase, a more focused redefined problem statement will be created and the insights discovered will aid in the Concept Development phase. To have a useful and implementable design, there will be two rounds of validation with experts, the doctors, the lab technicians, or child social workers from the hospital, and one testing session with children during the Refine Phase.

During the project is the Norooz holiday (Persian New Year), which will push back the end date by 7 working days.

Initials & Name T Ekhtiar Student number 4811720

Title of Project Enhancing Curiosity to Create a Child-Centered EEG Experience

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

I enjoy designing empathetic products that balance the needs of the different stakeholders to create the most optimal design. When looking back at my previous work I have found that I am drawn to medical products because of the meaningful quality they have. This project is interesting to me because of the relation between the medical, children, and playful experiences. Previously I have worked on two medical projects in the MSc program: Moosh, a playful toy to improve the consultation experience for children with cleft lip and palate, and the Schistoscope, a low cost 3D printed smart diagnostic tool that diagnosis schistosomiasis. I am looking forward to implementing different learnings from each project and from electives such as the Design for Emotion course, using the micro and macro emotion scan in order to see what emotions are evoked during the EEG test. In combination with the learnings from Moosh and Context Mapping course, I would like to create a thorough journey map of the patient, parent, and doctors/nurses. Using methodologies from the Design for Children ' s Play courses to create a system that is playful for children and allows them to learn and explore in their own way.

I am looking forward to working with the Sophia Children ' s Hospital, to design a system that works for all the stakeholders and is able to be implementable in the hospital, something that was lacking from previous projects. This is also why I have used multiple testing sessions, in order to create an implementable design for the hospital. The co-creation sessions is something that I have only had the opportunity to do once, so I am excited to push my skills further. I am also happy to work with the other graduate students who are also designing for the brain lab because although my project will be worked on independently, it will also be part of a larger system that can improve the hospital experience for the children visiting.

References

[1] The Boston Consulting Group. (2014). How Dutch Hospitals Make Value-Based Health Care Work. Retrieved on November 3 from https://www.bcg.com/publications/2018/how-dutch-hospitals-make-value-based-health-care-work.aspx
[2] Stanford Children's Health. (n.d.). Retrieved February 26, 2020, from https://www.stanfordchildrens.org/en/topic/default?id=electroencephalogram-eeg-for-children-90-P02599
[3] What happens when my child has an Eeg? (2016). Retrieved from https://www.youtube.com/watch?v=TNifQCrluo4&ab_channel=WWCIHCharity
[4] Muskat, B., Riosa, P. B., Nicholas, D. B., Roberts, W., Stoddart, K. P., & Zwaigenbaum, L. (2014). Autism comes to the hospital: The experiences of patients with autism spectrum disorder, their parents and health-care providers at two Canadian paediatric hospitals. Autism, 19(4), 482 – 490. doi: 10.1177/1362361314531341
[5] Gielen, M. (2019). Children ' s perceptions of the brain and hospital visits.
[6] Coyne, I. (2008). Children's participation in consultations and decision-making at health service level: A review of the literature. International Journal of Nursing Studies, 45(11), 1682 – 1689. doi: 10.1016/j.ijnurstu.2008.05.002
[7] Cameron, J. A., Bond, M. J., & Pointer, S. C. (1996). Reducing the anxiety of children undergoing surgery: Parental presence during anaesthetic induction. Journal Paediatric Child Health, 32, 51 – 56

FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Initials & Name T Ekhtiar Student number 4811720

Title of Project Enhancing Curiosity to Create a Child-Centered EEG Experience

Appendix B

Traditional EEG Test Procedure

EEG Procedure for Patient

Prehospital

1. **Preparation:** Parent gets small information to patient about going to get an EEG from hospital
    a. Parent explains some part of procedure to child - sometimes watch video
    b. Patient may be asked to not sleep as much the night before if its needed to sleep during EEG
    c. No hair gel on patients hair to prevent disruption of the electrodes

Arrive at Hospital / Introduction

2. **Waiting:** Waiting in waiting room
    a. Lab tech sets up space
        i. Prepares gel and q-tips
        ii. Places electrodes by bed
        iii. Gets pillow easily accessible
        iv. Turns on / Sets up computer
3. **Greeted** by lab technician and brought to the EEG test space
    a. Usually one parent is allowed in the room with the patient

In the space / Preparing EEG

4. **Choose movie:** Patient is **picks** the movie they want to watch
5. Patient **sits** onto the bed
    a. Put on movie and patient **watches**
6. **Explanation of procedure:** Lab technician **shows** the electrodes being used to the patient and explains the procedure as clear as possible and that it isn't painful to the patient and parent
7. **Get in position:** Patient lays down on hospital bed - lab tech brings pillow to put behind head
8. **Measure and mark head:** Lab technician **marks** patient's head for electrode placement using a measuring tape and red pen
    a. Lab tech makes conversation with parent or patient
9. **Demonstrate placing electrodes:** Lab tech explains the cotton swab part of the procedure and shows the cotton swab rubbing on their own, parents, and/or patient's hand
10. **Placing electrodes:** Lab technician rubs cotton swab with gritty gel on patients head (21 electrodes to put on & two on heart) and tapes each electrode on
    a. Takes between 5 - 30 min
    b. Lab tech makes conversation with parents or patient
    c. Patient usually watches the TV

    d. Lab tech counts each electrode (“1,2,3”) to show how long each one will take to patient
11. **Check Electrode Placement:**
    a. Lab technician attaches electrodes to the machine
    b. Lab technician tests if electrodes are working
    c. Adjusts electrodes if needed

EEG Reading - Patients do activities for EEG

12. **Demonstrate Exercises:** Lab technician **demonstrates** exercise and has patient practice (depending on age or demeanor of patient)
    a. Open / close eyes - Count to 10 (slowly)
    b. Hyperventilation
    c. Flashing light
13. **EEG Test:** Patient does the EEG test and exercises
14. **Close eyes** (count to 10)
15. **Open eyes**
16. **Hyperventilation**
17. **Flashing lights**

Clean Up

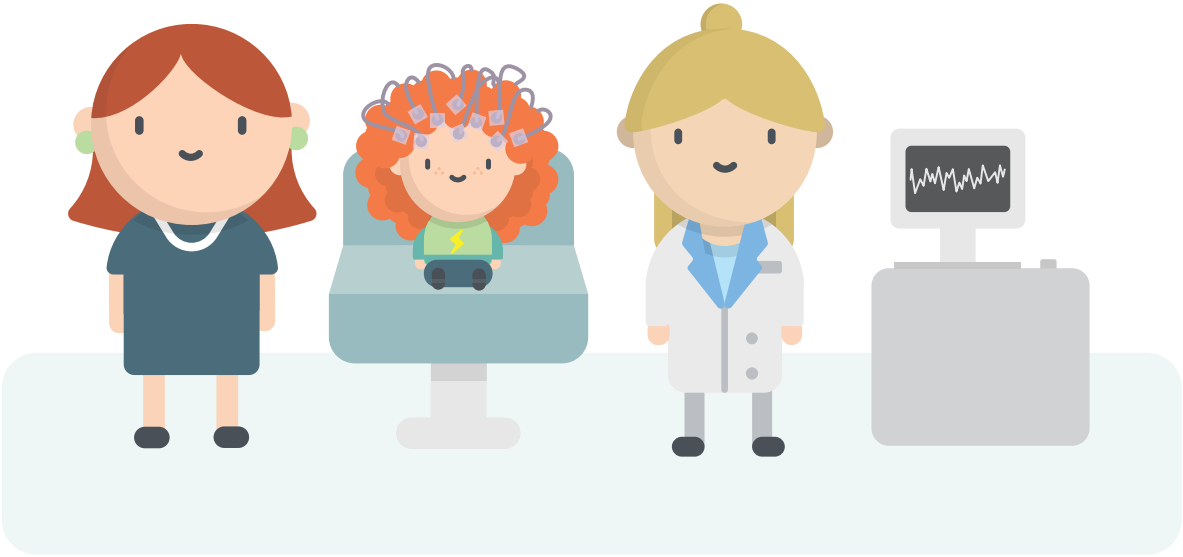
18. **Bring Supplies:** Lab technician brings towels and warm water to wash patients hair
19. **Rinse Hair & Remove Electrodes:** Uses water to rinse hair and carefully remove electrodes and tape
20. **Remove Gel:** Uses towel and water to get gritty gel out of hair
    a. Sometimes combs hair
21. **Choose toy:** Patient gets to choose a toy at the end
    a. Sometimes parents **take a picture** of child with electrodes
22. Go Home: Consultations and procedures are usually not held at the same time as the EEG test as this may affect the results

Appendix C

Context Mapping Flyer / Booklet

Flyer
Booklet - English
Stickers
Booklet - Dutch
Filled in Booklet
Notes from Interview

Help to Improve Children's Experience Taking an EEG Test!



Designing a new **child-centered** EEG experience

Sophia Children's Hospital is improving their patient's experience by creating a new Child Brain Lab and this project focuses on the EEG station. To improve the EEG station, we are looking from the child-patient's perspective to better understand their experiences.

Who am I?

I'm Tina, an Industrial Design Engineering Master's student from TU Delft, working on this project for my thesis. As a designer, I like to look from the user's point of view and am interested in improving patient, family, and healthcare providers' experiences at the hospital.

What do I ask from you?

To learn from you!

Due to the coronavirus outbreak, I am no longer meeting patients and parents at the hospital. Because of this, I'm looking for patients and parents who can help me continue my research by telling me about their stories of getting an EEG test.

How will the research be done?

The research will be conducted online, with a print out booklet and video call to talk a bit more about your experience.

If you would like to participate, you can inform your lab technician or fill out the form by scanning the QR code or following this link:

https://tinyurl.com/s86q5nu

Thank you for your help!

Erasmus MC Universitair Medisch Centrum Rotterdam

Vrienden van het Sophia

TU Delft Delft University of Technology

EEG Station Experiences

Hello! I'm Tina

I'm an industrial design engineer and right now I am designing the EEG station for the future Child Brain Lab at the Sophia Children's Hospital, which is why I need your help to learn from your experience getting an EEG.

This booklet is for your child to express their thoughts of the EEG experience (with your help as well if needed!) so feel free to draw, color, put stickers, or however else they would like to personalize it. There are cut outs at the end of the booklet that can be glued onto the pages too. There is no "wrong" way to fill it out!

When finished, please take pictures or a video explaining them with your child and email or Whatsapp them back to me.

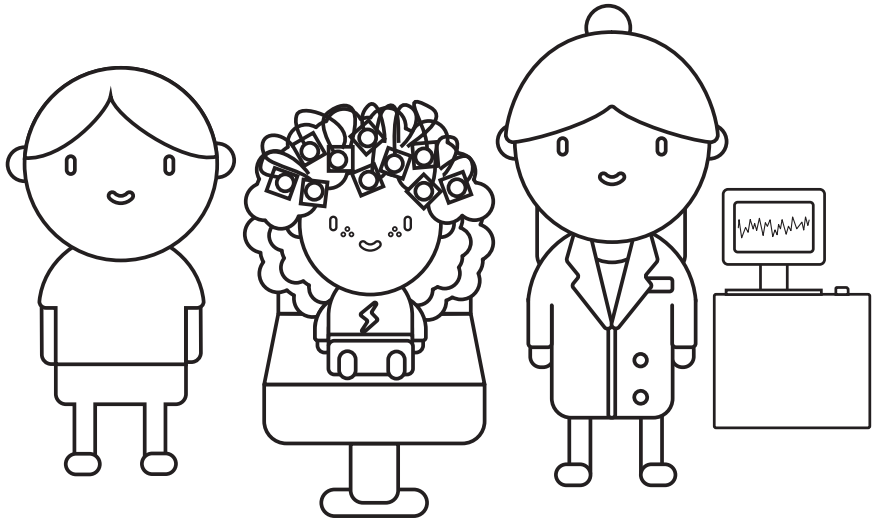
Afterwards, we will have a video chat to go over the pages. Because unfortunately I don't speak Dutch, the video chat will be in English, so I understand I may only speak with you, but it would be great to have your child also giving their opinion and comments as well!

If you have any questions please don't hesitate to contact me.

Thank you for your help!

- Tina

Email: t.ekhtiar@student.tudelft.nl
Whatsapp: +1 (310) 628-3513



A BIT ABOUT YOU...

Draw your family and put age and names for everybody.
What is a game you all like to play together?

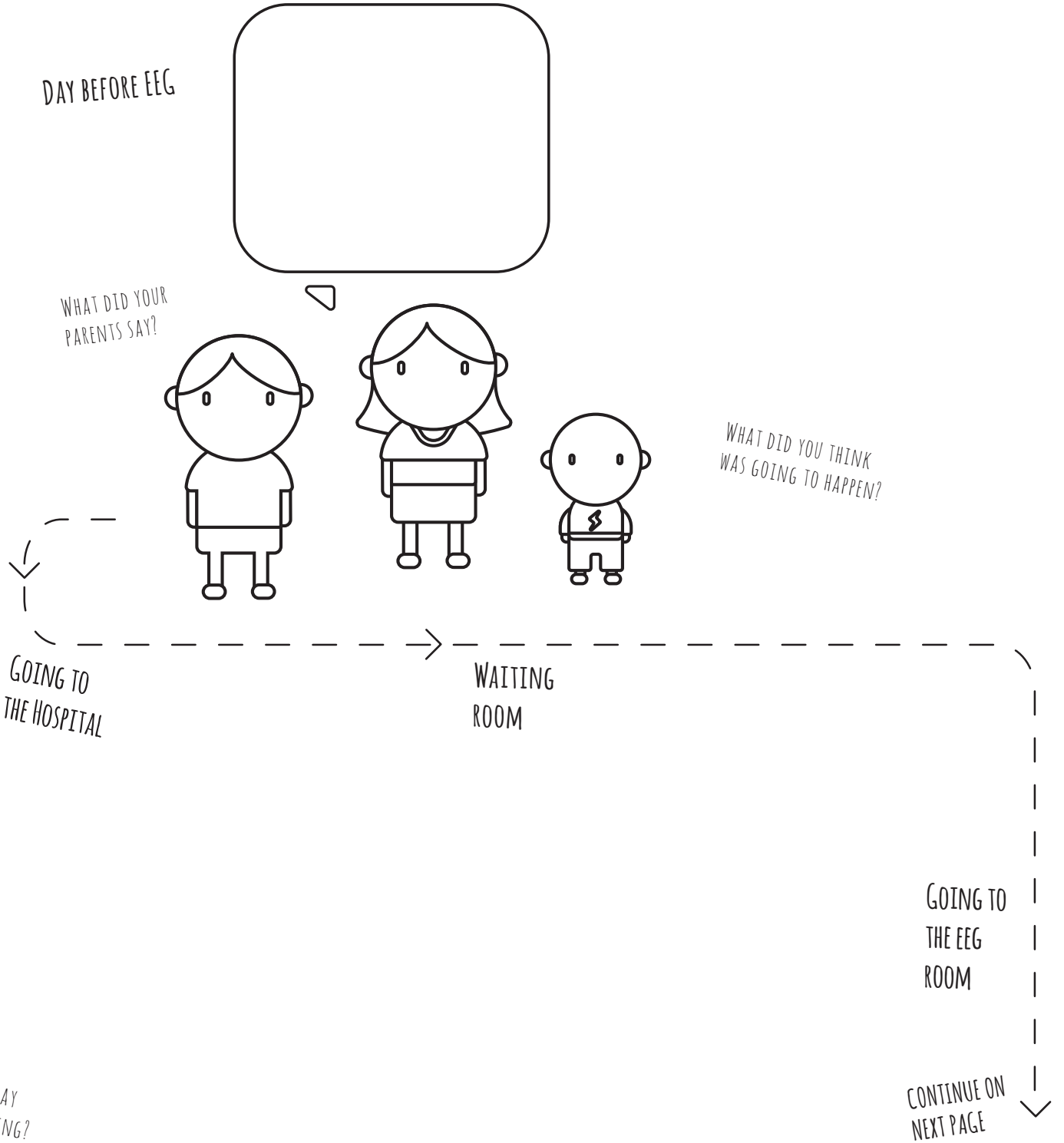
Your most recent EEG scan

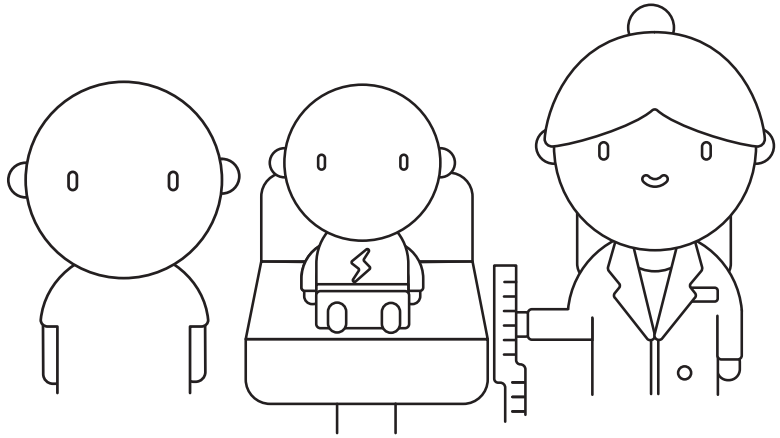
1. **Write, color, add stickers, or glue cutouts (found on the last pages)** in this timeline of **what happened** at your most recent EEG experience. **Who** was there? What did they **say**? What were you thinking about? Add in extra speech & thought bubbles or extra steps if they are missing in the timeline!

2. Afterwards, **draw in the emotions on the faces** of who was there. Were there any moments you felt worried or nervous? Was there a moment when you laughed or were curious? Here are some example faces you could draw:

Laughing **Uncomfortable** **Nervous** **Curious**

3. At the end, draw two green stars for two fun moments and a red star for a moment that was less fun. Add a blue star for the most memorable moment!

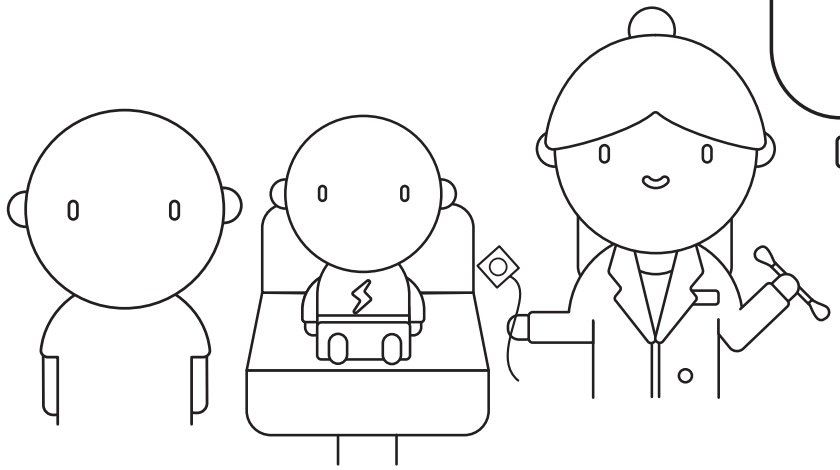




WHAT DID YOUR LAB TECHNICIAN EXPLAIN?

MEASURING & MARKING HEAD

PUTTING ON ELECTRODES



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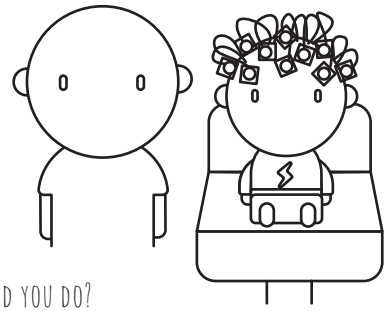
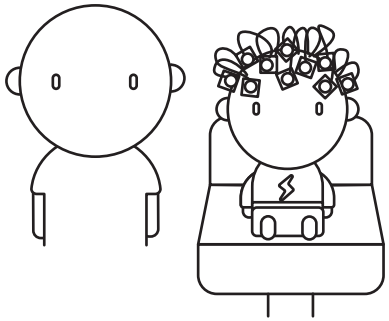
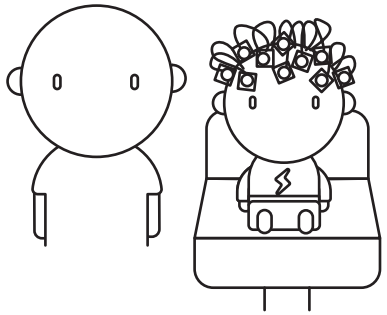
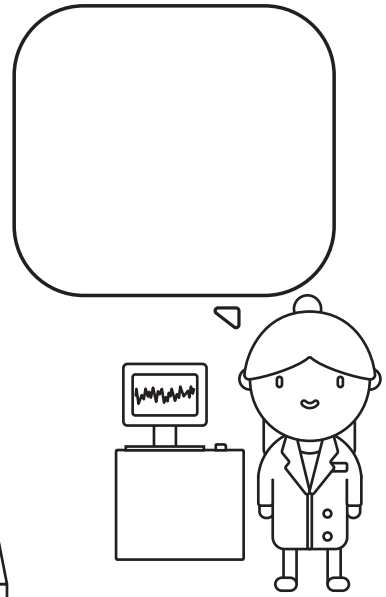
EEG EXCERCISES



WHICH ONES DID YOU DO?



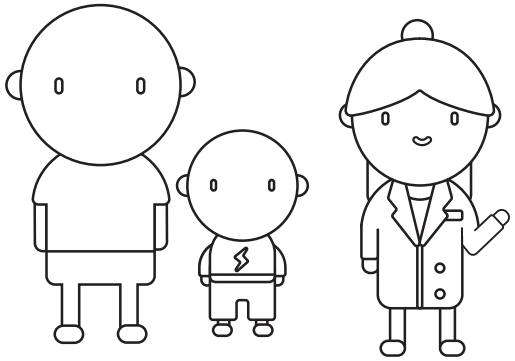




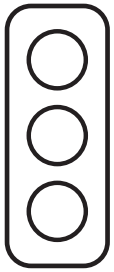
DID THEY BRING YOU ANYTHING?

TAKING OFF ELECTRODES & WASHING HAIR

DID YOU DO ANYTHING SPECIAL AT THE END?

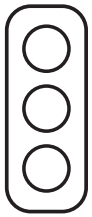


BYE!

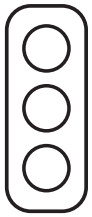


DO YOU AGREE OR DISAGREE?

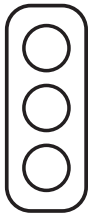
If you agree, color the flashlight green, if don't, color it red. Not sure? Color it yellow!



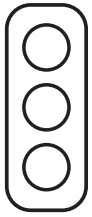
I understood why I had to do the EEG test



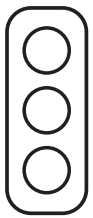
I would not mind if the doctor would only talk with my parents



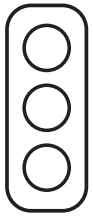
I was curious to see the EEG results



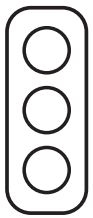
I sometimes think they keeping information away from me



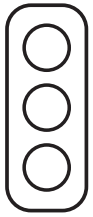
The doctor and lab technician answered all my questions



The doctor showed me the EEG result



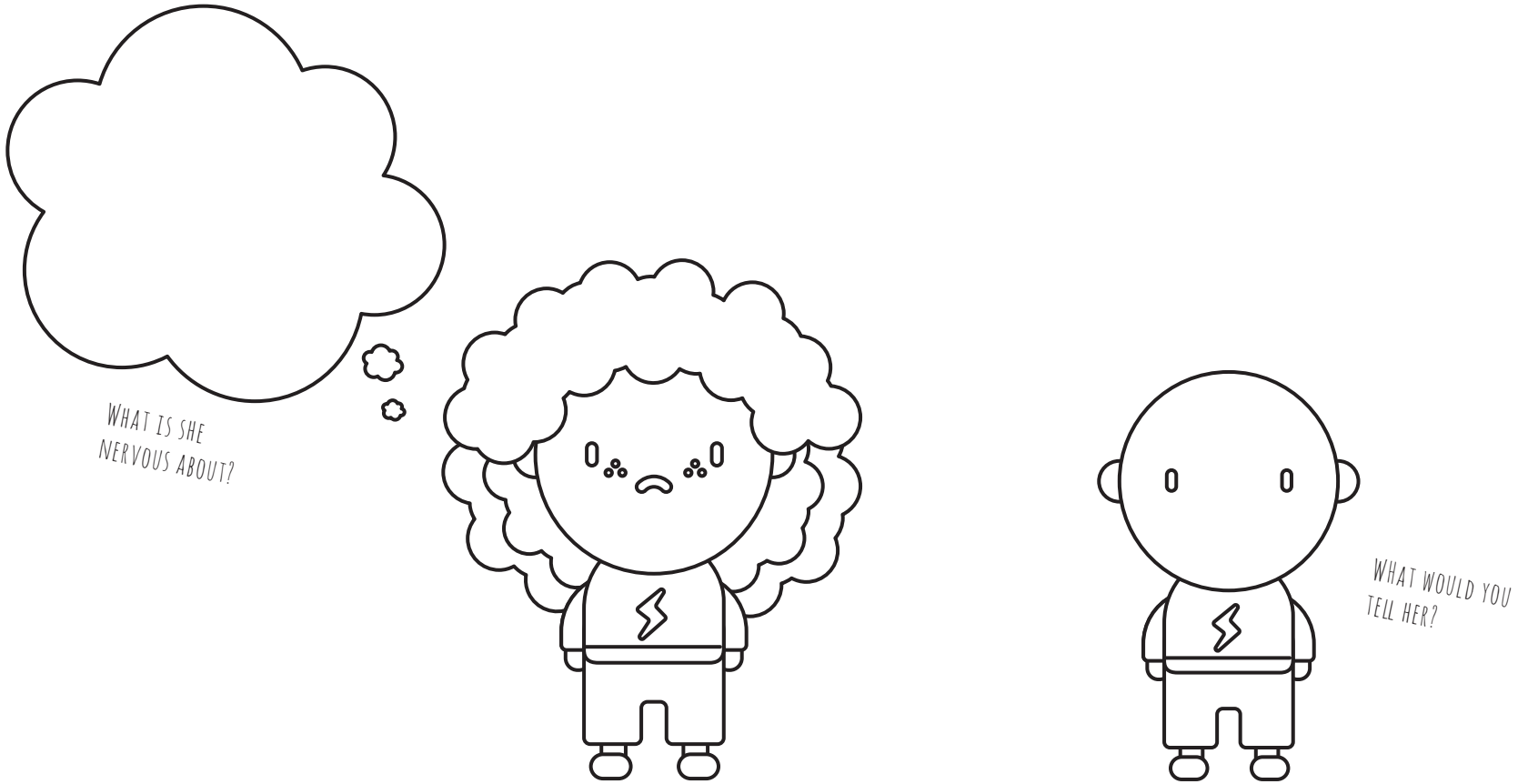
I didn't really have any questions about the EEG



I wish I would see what the doctors would see during the EEG

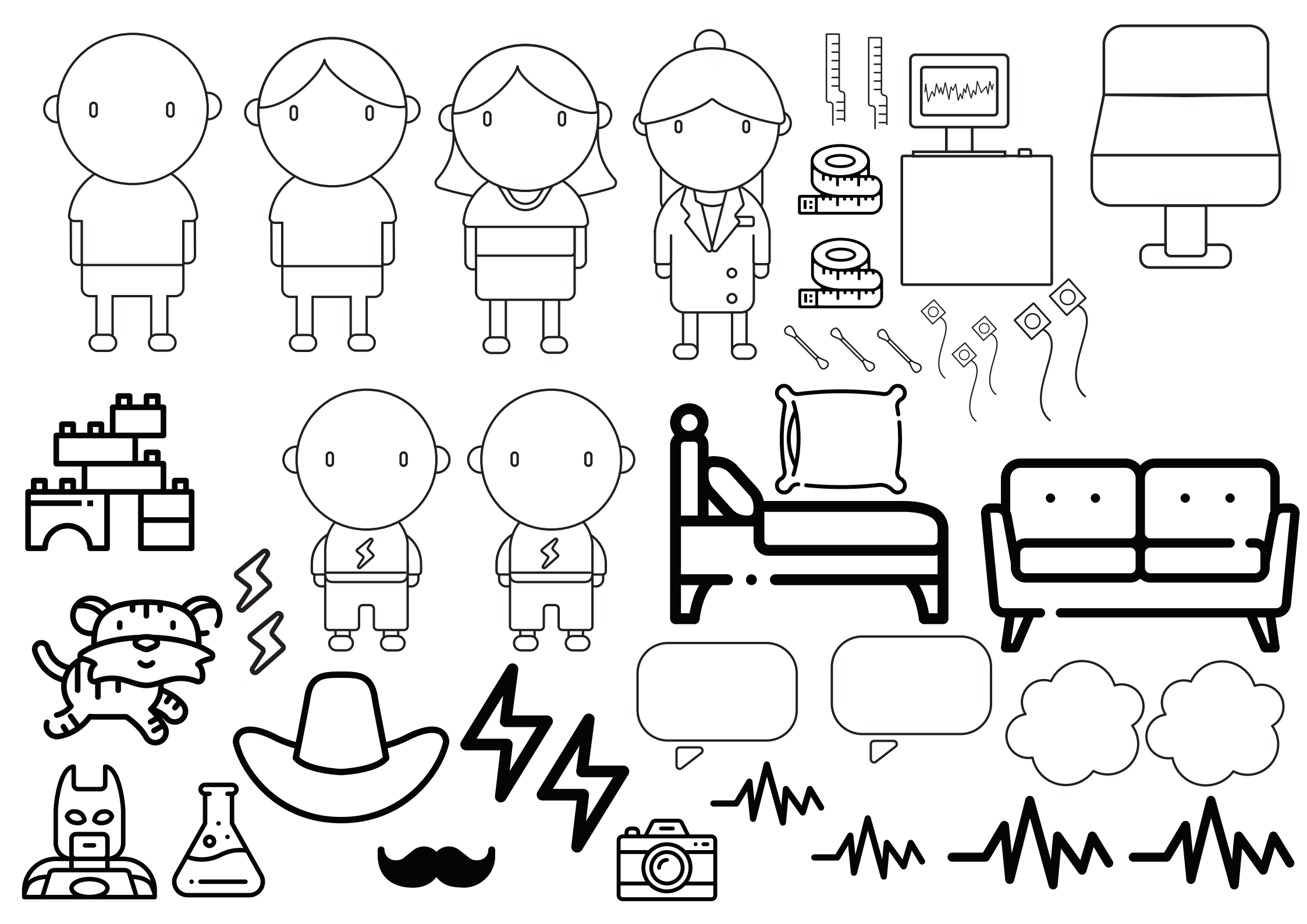
YOUR FRIEND IS GOING TO GET AN EEG TOO

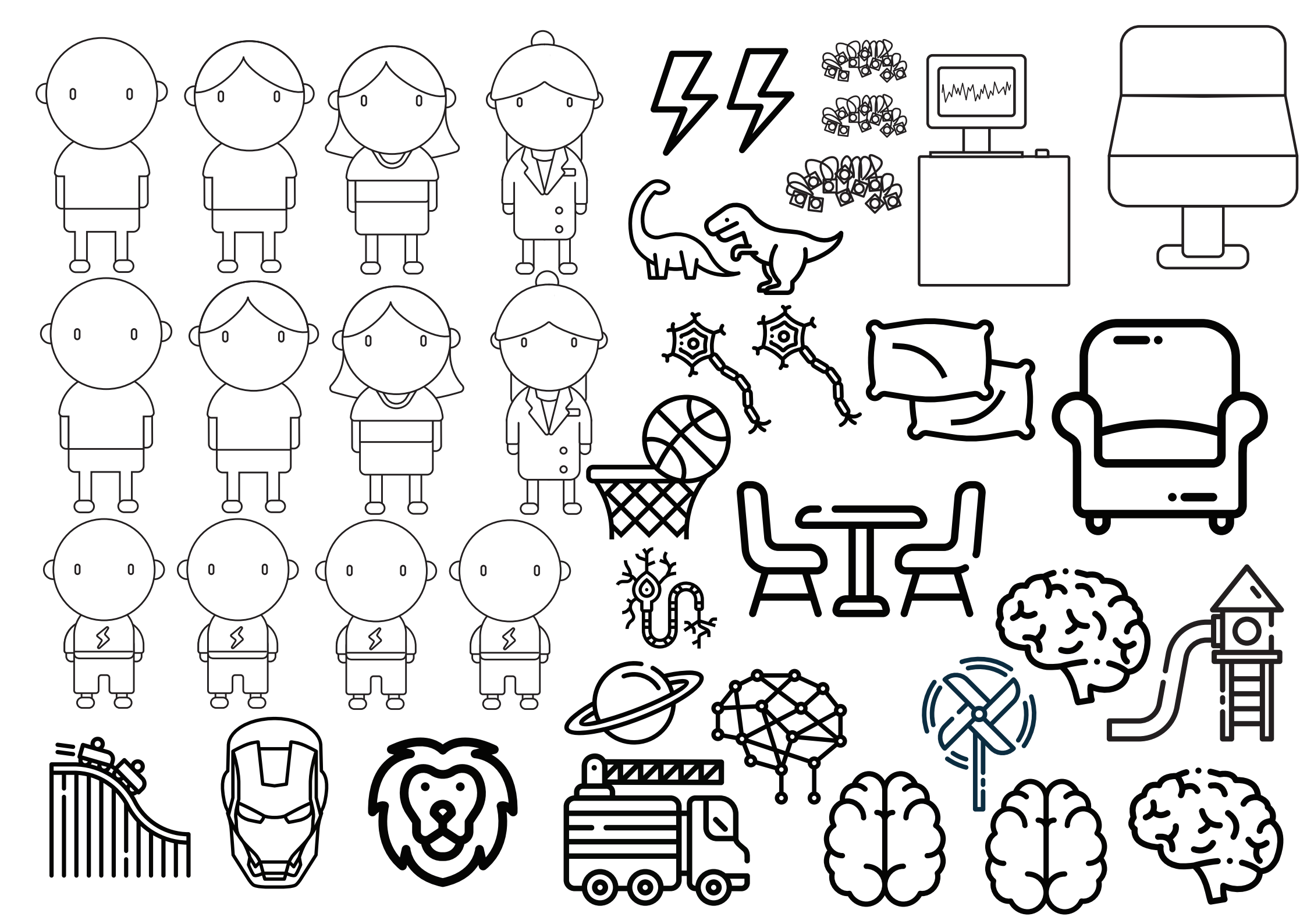
Imagine your friend is getting an EEG scan too. They are nervous and ask you what is going to happen. How would you explain it to them? Draw, collage, or write what you would tell them.



DESIGN YOUR OWN EEG STATION

If you were to design your own EEG station, what would you put there? Tip: Use the cutouts in the back or find your own from magazines!







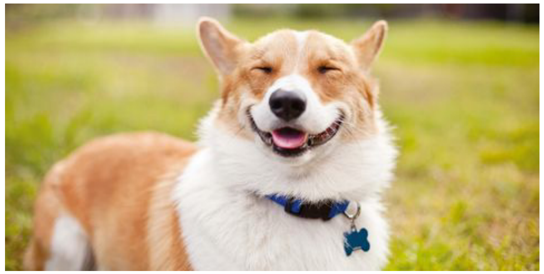

















EEG Station Experiences

Hello! I'm Tina

I'm an industrial design engineer and right now I am designing the EEG station for the future Child Brain Lab at the Sophia Children's Hospital, which is why I need your help to learn from your experience getting an EEG.

This booklet is for your child to express their thoughts of the EEG experience (with your help as well if needed!) so feel free to draw, color, put stickers, or however else they would like to personalize it. There are cut outs at the end of the booklet that can be glued onto the pages too. There is no "wrong" way to fill it out!

When finished, please take pictures or a video explaining them with your child and email or Whatsapp them back to me.

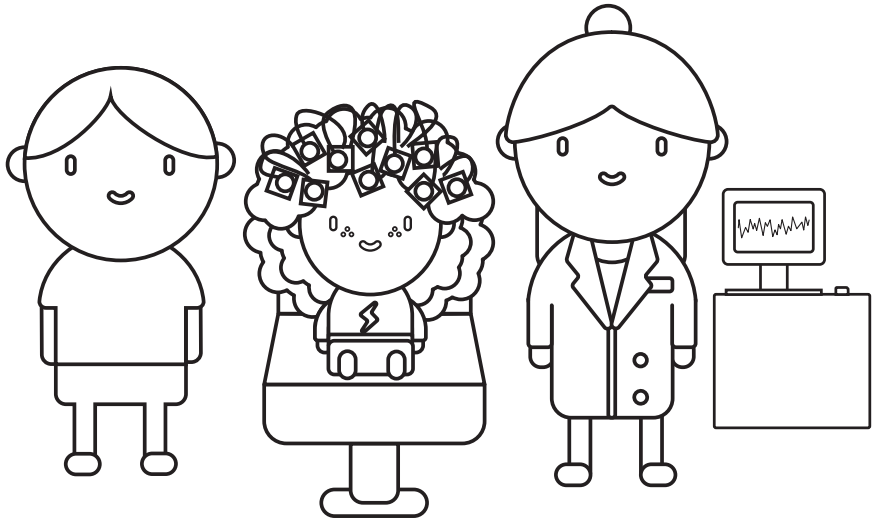
Afterwards, we will have a video chat to go over the pages. Because unfortunately I don't speak Dutch, the video chat will be in English, so I understand I may only speak with you, but it would be great to have your child also giving their opinion and comments as well!

If you have any questions please don't hesitate to contact me.

Thank you for your help!

- Tina

Email: t.ekhtiar@student.tudelft.nl
Whatsapp: +1 (310) 628-3513



EEN BEETJE OVER JOU

Eerst iets over jezelf!

Teken je familie hier. Zet erbij hoe iedereen heet en hoe oud iedereen is.
Is er een spel wat jullie graag samen spelen?

Je laatste EEG test

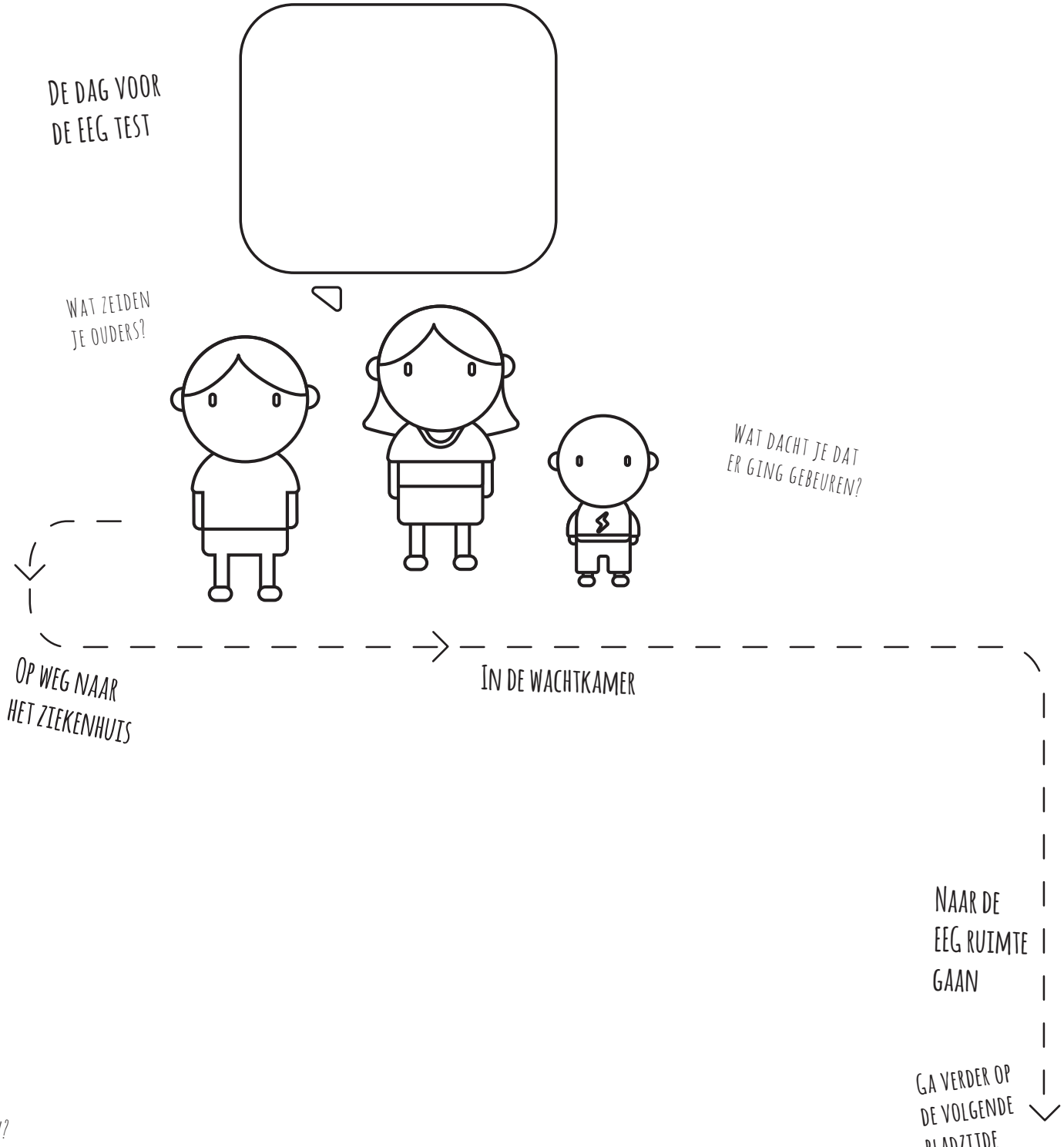
1. Hoe ging je laatste EEG test? Vertel je verhaal op de tijdlijn hieronder. Wie was erbij? Wat zeiden ze? Wat dacht je toen?

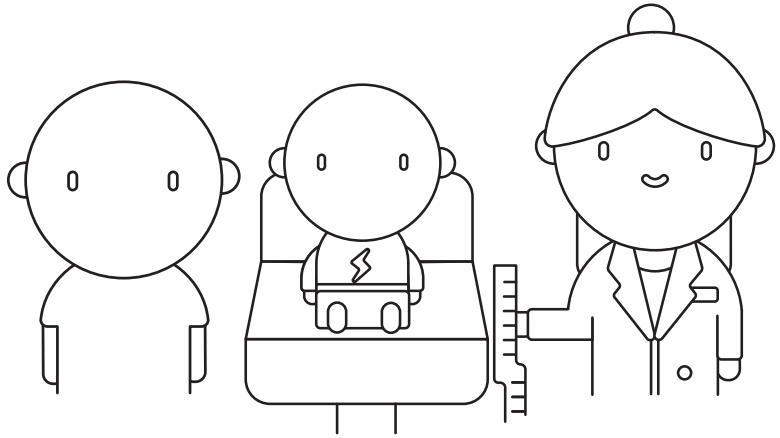
Vul de spraakwolkjes en gedachtewolkjes in. Je kan ook je eigen spraakwolkjes of gedachtewolkjes tekenen en invullen. Ook kan je de plaatjes op de laatste bladzijde uitknippen en gebruiken in je verhaal.

Grappig **Ongemakkelijk** **Nerveus** **Curieus**

2. Daarna mag je de gevoelens van iedereen tekenen. Hoe voelde iedereen zich? Voelde jij je wel een bang of nerveus? Was je soms nieuwsgierig of moest je soms lachen? Hier zijn wat voorbeeld gezichtjes die je kunt tekenen:

3.Dan mag je twee groene sterren tekenen bij twee leuke momenten. Zet een rode ster bij een minder leuk moment. Als laatste, mag je een blauwe ster zetten bij het moment wat je het beste herinnerd.

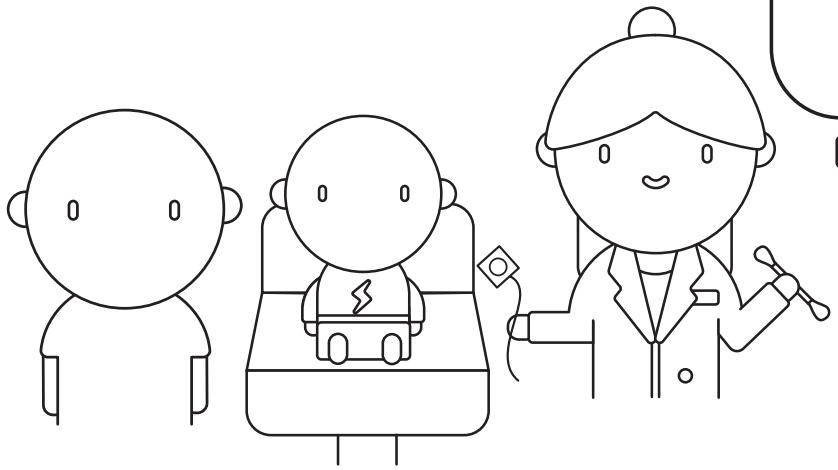




Wat zei de laborant?

Hoofd opmeten en markeren

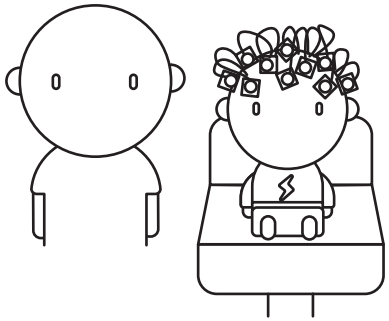
Elektrodes opdoen

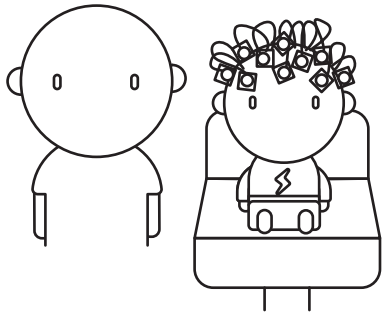


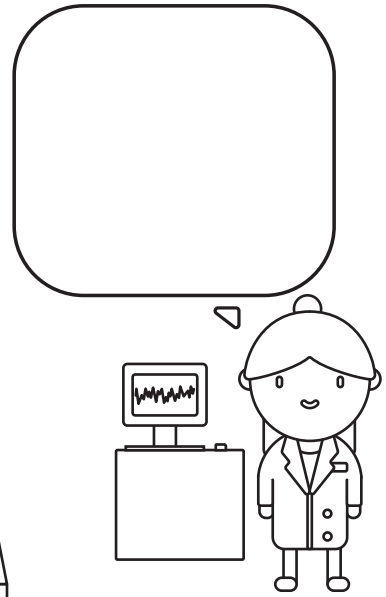
Ga verder op de volgende bladzijde

EEG OEFENINGEN DOEN

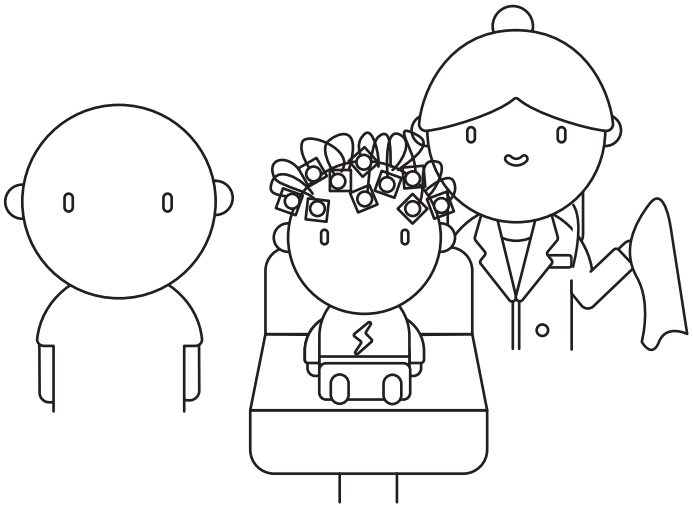
WELKE OEFENINGEN HEB JE GEDAAN?





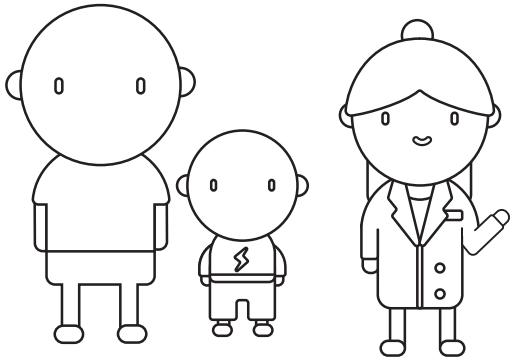


HADDEN ZE IETS MEEGENOMEN?



ELEKTRODES AFDOEN EN HAREN WASSEN

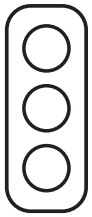
DEED JE NOG IETS BIJZONDERS AAN HET EINDE?



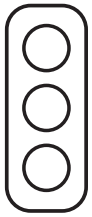
DOEI!

Mee eens of niet mee eens?

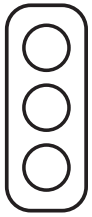
Met welk van zinnen hieronder ben jij het eens? Kleur het stoplight groen als je hetzelfde denkt, kleur het rood als je niet zo denkt. Twijfel je? Kleur het dan geel!



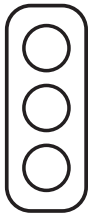
Ik begreep waarom ik de EEG test moest doen



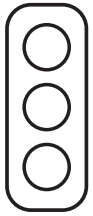
De dokter en laborant hebben al mijn vragen beantwoord tijdens de test



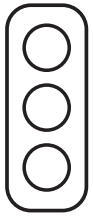
De dokter heeft mij de resultaten van EEG laten zien



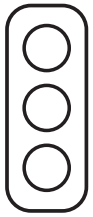
Soms heb ik het gevoel dat ze mij dingen niet vertellen die ik wel wil weten



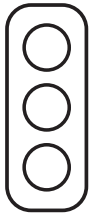
Ik vind het niet erg als de dokter alleen met mijn ouders praat na de test



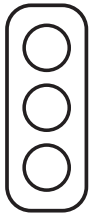
Ik zou willen dat ik kon zien wat de dokters zien tijdens zo'n test



Ik zou graag beter willen weten waar zo'n test voor is en wat er uit komt.



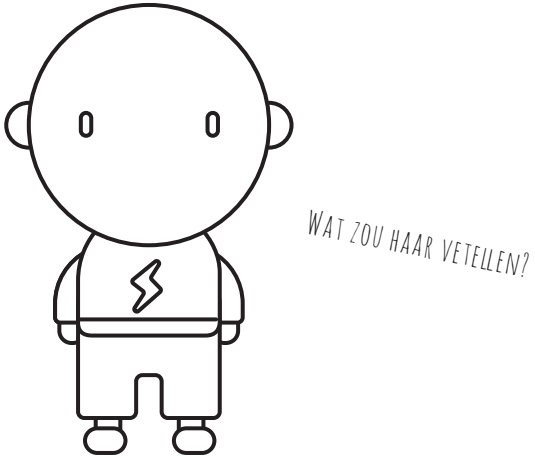
Ik had niet echt vragen tijdens de EEG test



Ik zou graag beter willen weten waar zo'n test voor is en wat er uit komt.

Een klasgenootje moet ook een EEG test doen

Stel je voor dat een klasgenootje van je ook een EEG moet doen. Zij is een beetje nerveus en vraagt aan jou wat er gaat gebeuren. Hoe zou jij het haar uitleggen? Vertel wat je haar zou vertellen door te schrijven, te knippen, plakken, of kleuren.



Ontwerp je eigen EEG ruimte

Als jij je eigen EEG ruimte zou ontwerpen, wat zou je daar dan in zetten? Tip: Gebruik de plaatjes achter in dit boekje. Je kunt ze uitknippen!

EEG Ervaringen

Hallo, Ik ben Tina!

Ik ben een industrieel ontwerper en momenteel ben ik bezig met het herontwerpen van de EEG test voor het nieuwe Kinderhersenlab van het Sophia kinderziekenhuis. Hierbij kan ik veel leren van jullie ervaringen met de EEG test en kunnen jullie mij dus goed helpen!

Dit boekje is gemaakt voor uw kind om hem of haar te helpen met zich uit te drukken over zijn ervaringen met de EEG. Daarbij mag jij natuurlijk ook helpen als ouder als dat nodig is! Voel jullie vrij om het boekje jullie eigen te maken door er in te tekenen, schrijven, knippen en te plakken. Het gaat uiteindelijk om jullie meningen en ervaringen en er zijn dus ook geen 'foute' antwoorden.

Als je klaar bent, zou ik het fijn vinden als je foto's maakt van het ingevulde boekje en die naar mij opstuurt via mail of Watsapp.

Hierna hebben we een video gesprek over het boekje. Omdat ik jammer genoeg geen Nederlands spreek (dit boekje is laten vertalen), zal dit gesprek in het Engels zijn. Ik snap dat ik dan niet veel met het kind in gesprek ga zijn maar ik zou het toch fijn vinden als hij erbij is zodat hij zijn mening en andere opmerkingen kan geven.

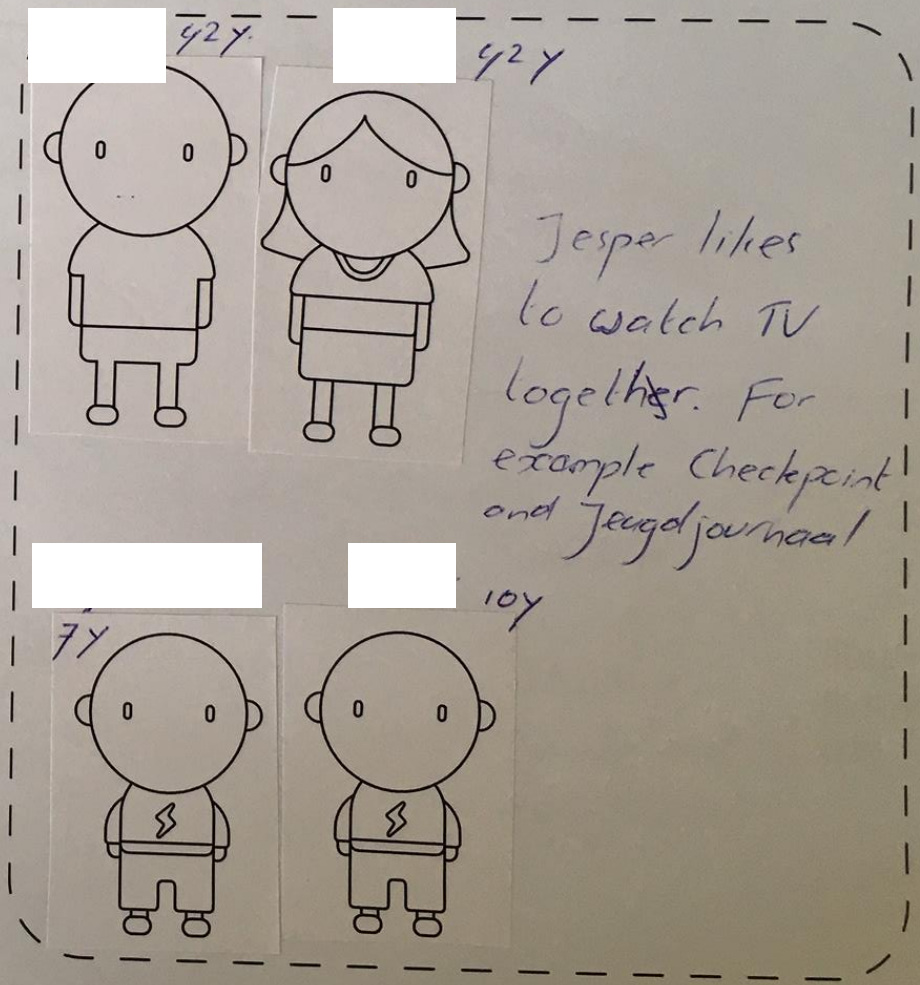
Als je nog vragen op opmerkingen hebt, kunt u mijn altijd bereiken op:

Email: [redacted]
Whats[redacted]

Een beetje over jou

Eerst iets over jezelf!

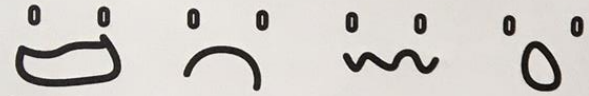
Teken je familie hier. Zet erbij hoe iedereen heet en hoe oud iedereen is. Is er een spel wat jullie graag samen spelen?



JE LAATSTE EEG TEST

1. Hoe ging je laatste EEG test? Vertel je verhaal op de tijdlijn hieronder. Wie was erbij? Wat zeiden ze? Wat dacht je toen?

Vul de spraakwolkjes en gedachtewolkjes in. Je kan ook je eigen spraakwolkjes of gedachtewolkjes tekenen en invullen. Ook kan je de plaatjes op de laatste bladzijde uitknippen en gebruiken in je verhaal.



Grappig Ongemakkelijk Nerveus Nieuwsgierig

2. Daarna mag je de gevoelens van iedereen tekenen. Hoe voelde iedereen zich? Voelde jij je wel een bang of nerveus? Was je soms nieuwsgierig of moest je soms lachen? Hier zijn wat voorbeeld gezichtjes die je kunt tekenen:

3.Dan mag je twee groene sterren tekenen bij twee leuke momenten. Zet een rode ster bij een minder leuk moment. Als laatste, mag je een blauwe ster zetten bij het moment wat je het beste herinnerd.

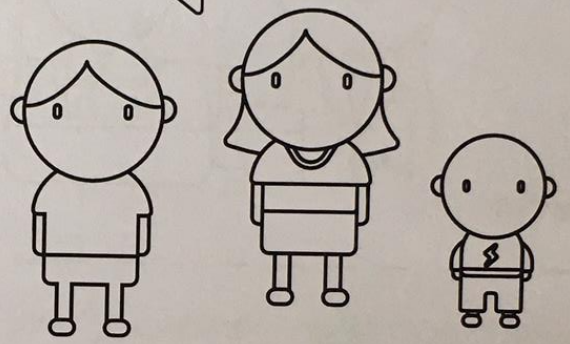
There was no 'bad' moment

DE DAG VOOR DE EEG TEST

That I don't have to lay in the tunnel (MRI) because I don't like the tunnel.
That it doesn't hurt

I didn't know what would happen. I was exited when we went to the hospital, but was not afraid.

WAT ZEIDEN JE OUDERS?



WAT DACHT JE DAT ER ZOU GEBEUREN?

OP WEG NAAR HET ZIEKENHUIS

I went to the hospital with my dad.

IN DE WACHTKAMER

While waiting I drank hot chocolate ☺ I watched a video on my dad's phone. ☺
Toys in the waiting room were for small childeren. My dad said not to touch them because of Corona 😐

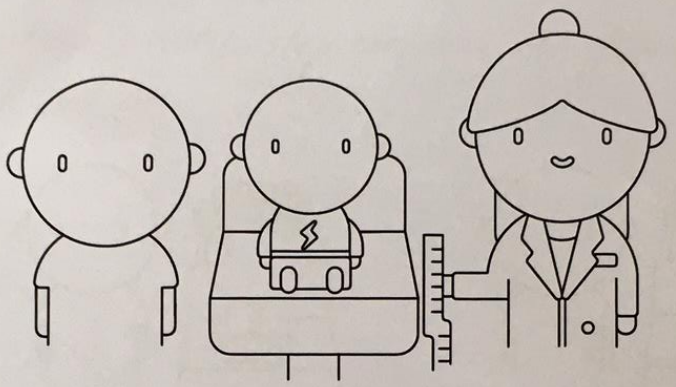
HAD JE IETS MEEGENOMEN OM MEE TE SPELEN?

NAAR DE EEG RUIMTE GAAN

GA VERDER OP DE VOLGENDE BLADZIJDE

The laboratory technician was very friendly. I liked that she let me choose a film to watch. I chose The Minions. When I was inside the room I was more relaxed. I don't know why.

WAT ZEI DE LABORANT?



HOOFD OPMETEN EN MARKEREN

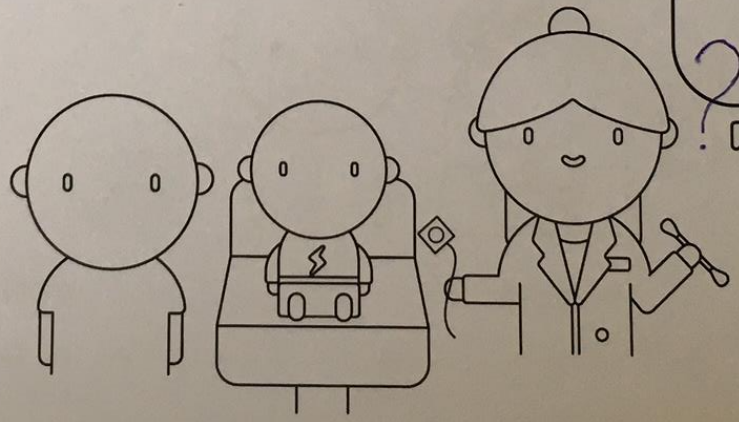
ELEKTRODES OPDOEN

I didn't really notice what the woman did, because I watched the film. It was very funny ☺

It was nice to just chill on the doctors sofa ☺

I don't remember what the woman said. It's already a long time ago.

??



GA VERDER OP DE VOLGENDE BLADZIJDE

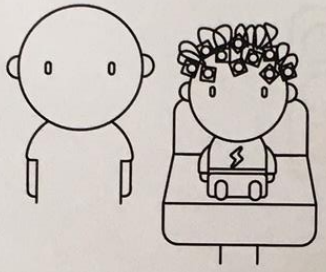
EEG OEFENINGEN DOEN

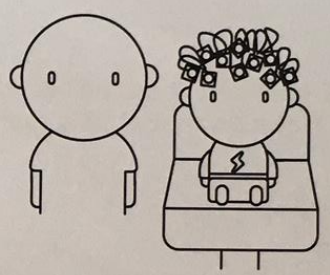
- open and close my eyes
- blow a toy windmill
- stare into a big lamp

I have no opinion about the tasks/exercises
During a task I had to stop watching the film,
but that was OK

It was nice that my father was there.
He didn't do anything, but without
my father it would have been a
bit scary

WELKE OEFENINGEN HEB JE GEDAAN?

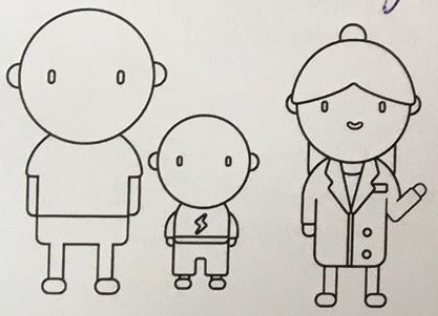




HADDEN ZE IETS MEEGENOMEN?

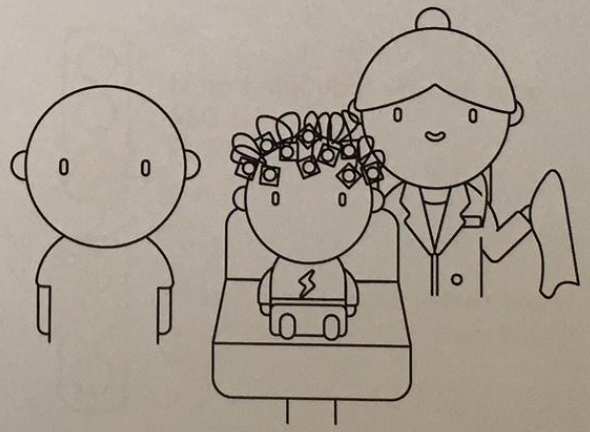
Normally when I go to hospital we
drink and eat something in the restaurant
afterwards. Not now. The restaurants
were closed because of Corona ☹

Taking off the electrodes didn't hurt



DOEI!

DEED JE NOG IETS BIJZONDERS AAN HET EINDE?

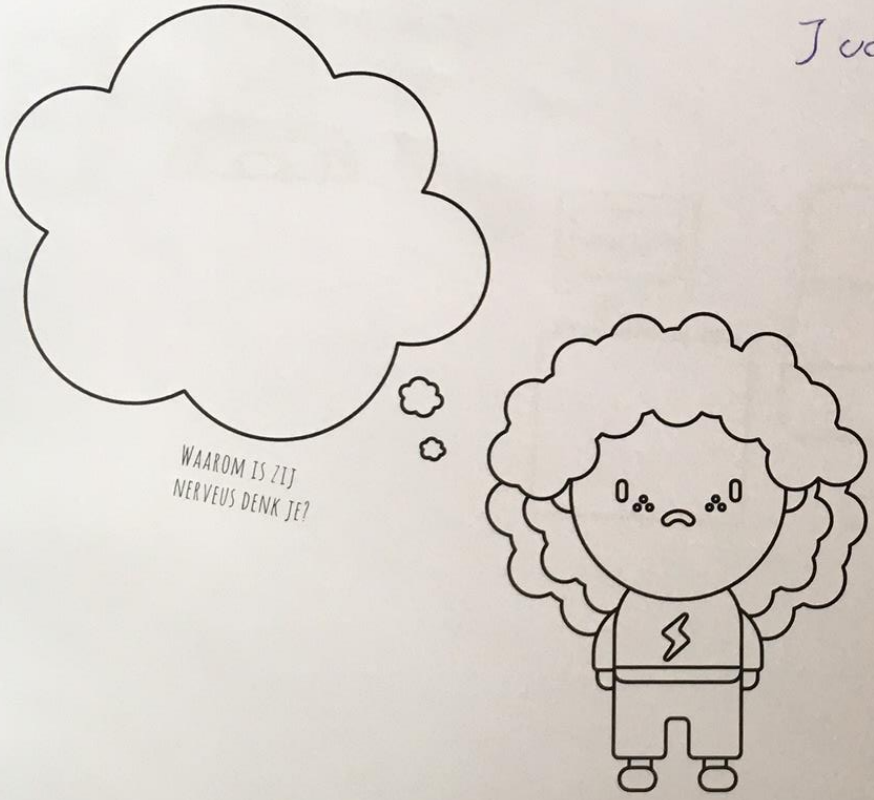


ELEKTRODES AFDOEN EN HAREN WASSEN

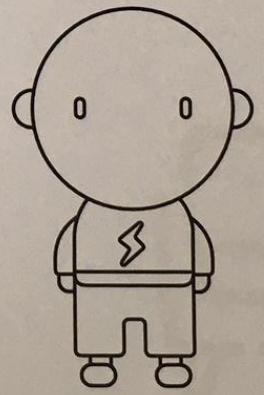
EEN KLASGENOOTJE MOET OOK EEN EEG TEST DOEN

Stel je voor dat een klasgenootje van je ook een EEG moet doen. Zij is een beetje nerveus en vraagt aan jou wat er gaat gebeuren. Hoe zou jij het haar uitleggen? Vertel wat je haar zou vertellen door te schrijven, te knippen, plakken, of kleuren.

I would tell that they put stickers on your head
I would tell that your mom or dad will be there
I would tell that you don't have to worry



WAAROM IS ZIJ NERVEUS DENK JE?

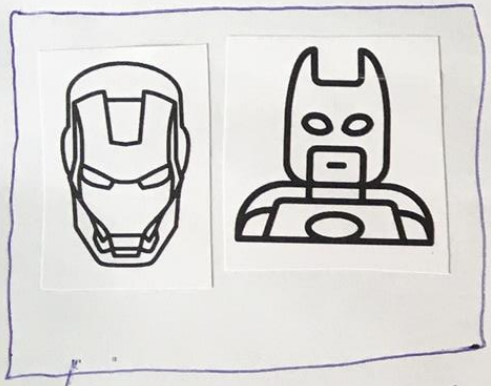


WAT ZOU HAAR VETELLEN?

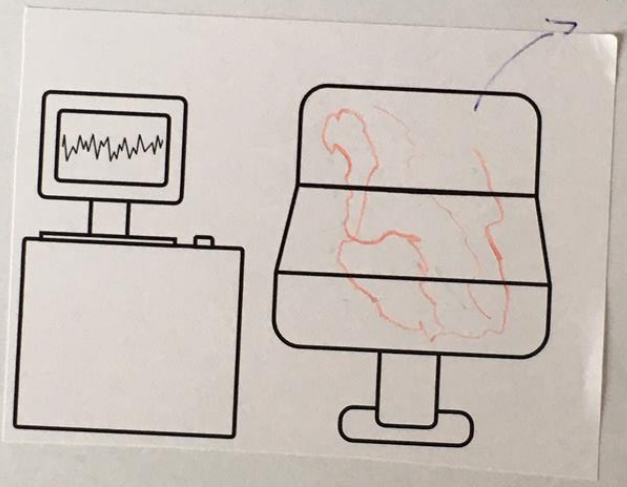
Ontwerp je eigen EEG ruimte

Als jij je eigen EEG ruimte zou ontwerpen,
wat zou je daar dan in zetten?
Tip: Gebruik de plaatjes achter in dit boekje.
Je kunt ze uitknippen!

- no boring white, but coloured walls

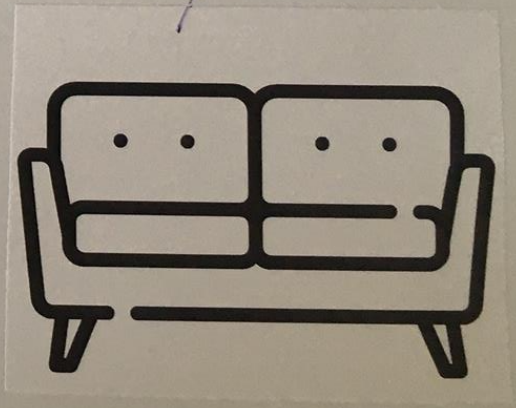


- a super hero poster on the wall



- happy designs ☺

- a nice bench for my dad to lay on



Context Mapping Interview Transcript

A - Parent
J - Child
T - Researcher

A bit about you

History

A: Y awell we know that this MRI he doesn't know at all, its quite scarey to be in the tunnel this whole time wiht the loud noises

- When he heard that there was a new scan he was nervous because he thought it would be similar to the MRI but wasn't after finding out it was for a different reason and he didn't have to go into the tunnel
- We will put some wires with stickers on his head and that it wouldn't hurt at all
- He wasn't nervous at all
- He asks J: J, "No"
- The area where the EEG is in the same place in the hospital as other things so he's kind of familar

T: "Oh nice! So he's kind of an expert a bit?"

A: (He asks J) J: Ya

- After the stroke he was there for 2 weeks
- And then he went to a rehabilitation place
- So he's not so nervous by the hopsital

T: "What makes him nervous or not nervous in the hospiatl"
A: (he asks J) He doesn't like the MRI and the tunnel but once we explained that it wasn't kind of scan then he wasn't nervous
When I asked 'What would you tell a friend' - he said that he would tell them that they don't have to be scared and your father or mother will be with you the whole time and then it is important to tell him before hand whether whats going to happen and if it will hurt or not. If it isn't going to painful that gets rid of most of the stress I think. SO if theres research and scans that don't hurt then its easier

T: And you're always honest about this stuff with him

A: Ya we are always honest, we don't always give away all the details because it may be too hard understand for him, but we aren't telling things that aren't true. As honest as possible

T: How early in advance do we tell him?

A: I think normally If there is an appointment with a doctor that we know is a few weeks or months in advance then we will tell him right away, that another scan is coming up. And then we don't talk about it until the day before the exam is. Not like everyday counting down of course. Like he knows in Fall he has another MRI scan coming and he doesn't like it but he knows its coming up

- We will won't mention just till right before the scan

Side coverstion: J went out of the room till we ask him questions

T: What was filling the timeline like for you?

A: Well it was weird times in the hospital because of the corona crisis so it was a bit desolate

- But we had no trouble parking and went to the neurology department
- And there there were very few people as well because the corona crisis was just starting
- I just told him that he can't touch anything (like the toys) and got hima cup of hot chocolate which he quiet likes as well
- Then I gave him my telephone and he watched some videos from there
- We had to wait a bit like 20-25 min then the lab tech came to direct us to the reserach room
- We didn't ahve to wait too long

T: In the waiting room / when greeted he was less nervous?

A: This whole research/scan I think he hasn't been nervous at all

- He was also relaxed when the lab technician came
- He just kind of let it happen
- Afterward when I was asking him questions about it and he said that the waiting room was quiet boring and that there was only toys for young kids and he couldn't even touch those
- **And that the walls are too white**! When I asked how he can improve the waiting room and EEG room he mainly said that the walls were too white and it should be less boring and more colorful

T: Also the lab tech's had said they had to take down the posters due to disenfect reasons so there was even less than before

A: Yes it quiet sterile

T: But he liked choosing the film!

A: Yes he really liked that, when the lab tech asked what kind of him and she just started calling the names of films but there were a lot of stuff for children so he was like "No, no, no and then there was this minion film and he was like "Ya I want to watch this one"

And he watched it and he was so taken by the film that he hardly noticed that he was putting stickers on his head or putting marks on his head. He hardly responded to that, he was just laughing at the film

T: Oh nice, so super distracted b the movie

A: Ya super distracted by the movie ya. ANd then during the reserach he had to stop the movie and do the small exercises like blow the small windmill and he was annoyed like “Oh I have to stop this movie again” But he was ok with it

T: But all the toys, movies were a bit to young

A: Ya they have ‘entertainment for children’ but they have enterntainment for children up until 6 and for older children there’s a bit less to do, so my phone works as well

T: Ya a traveling screen

Can you introduce the people in the picture? What show is the other one? (its like action shows?)
Who came with you to the appointments?
History: Has Jasper been in the hospital previously?
What was the favorite game you played with each other? Why?
Timeline
Can we go over the timeline? How was it to fill out?
Day before EEG
Do you usually prepare him for visiting the hospital? How far in advance? What kind of things do you tell him?
Reassure that it won’t hurt / won’t do the negative activites

What were some of the things that you explained before the EEG test?
Does he get confused by any of the explanations?
Did they have extra questions about anything?
How did they feel or react when you explained these things?
Why wasn’t he afraid?
Waiting Room
Did you bring anything extra to the hospital to pass the time?
What was your child doing then?
Did they seem nervous or carefree in the waiting room?
Toys were too young for him?

Have you met anyone else in the waiting room?
Going to EEG Room
Who greeted you?
Lab tech and she was friendly
Did they tell anything specific to you or your child as you were going to the room?
Choosing the film was fun?
He seemed more relaxed than in the waiting room
Why do you think so?
Measuring and marking head
How did your lab technician explain the measuring and marking of the head? - it was all a blur!

Was your child nervous, calm, etc?
Laughing and distracted by the movie (a highlight!)
Did they become uncomfortable at any point?
Did your lab technician do something to help?
Were they curious about anything during the process?
Putting on electrodes - was one of the best most memorable moments!
Why do you think it was the most memorable / best moments?
How did the lab technician explain putting on the electrodes?
Don't remember/wasn't paying attention - was it important to him?
Did they give a demonstration?

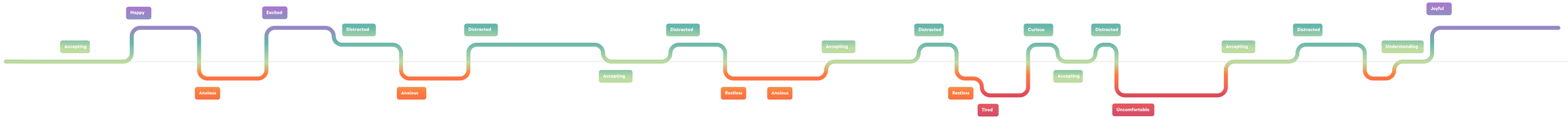
I know this is part of the most physically uncomfortable parts, did the process begin to get too uncomfortable at any point?
How did you comfort your child?
Did the lab tech do something to help?
Did he wask any questions during this process? Or more distracted by the Movie?

EEG Exercises
How did doing all the exercises go?
How did your lab technician explain the exercises?
Was your child impatient or bored during any of them?
Were they curious about anything during the exercises?
How did you explain that to them?
Were they any that they found uncomfortable?
How did you help them?
How did you feel?
What did the lab technician do?
Taking off electrodes
How did your child feel when the exercises were done?
How did you feel?

Did your child have any questions?
Did you do anything at the end? Did your lab tech show the results to your child?
Going home
Did you do anything special afterwards?
Did your child have any questions afterwards?
Extra
Looking back at your experience, what stood out/was memorable?
Why were those moments highlighted (the 2 best/most uncomfortable)?
Do you agree or disagree?
Why, why why
Was your child able to fill it in or did they need help?
Your friend is getting an EEG
Has any of your child's friends gotten an EEG? Have they made friends at the hospital?
How did your child fill it out?
How do they explain getting an EEG to their friend?
Why, why why
Design your own EEG station
Can you explain your EEG station to me?
Why did you put these parts here?
What would you definitely not put in your EEG station? Why?
Who comes to the EEG with you?
Do you want to see your EEG results?
Do you get to take home anything afterwards?

Appendix D

Patient Journeys



Preparation for EEG test

She had more questions the day the ambulance was called (and had a seizure)

Parents explained a bit about the EEG process, and that it would be a video of her brain

"It will be a film of your brain!"

"We can't see what is in your head so this is how we will see it."

She didn't have a lot of questions before hand

Waiting Room

Playing in the waiting room

Greeted by Lab Tech

Both parents came to the EEG room with her

Choose a movie

Excited to **choose** movie

Sit down on bed

Distracted by the TV

Explanation of procedure

Laying in kind of **tense and stiff position**

Shows the measuring tape and gives **simple explanation**

Child lays on bed

Distracted by the TV

Measure and mark head

Demonstrate placing electrodes

Lab tech **demonstrates** G-tip **on parent** then patient's hand

Placing electrodes

Watches Dora

Parents talk to lab tech to make conversation and ask questions

Lab tech gives explanations

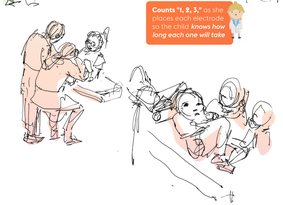
Dad leans in closer to Emma

Emma begins to get **restless from sitting still for so long**

Holds hands with Dad

Focuses on the TV

Counts "1, 2, 3," as she places each electrode so the child ***knows how long each one will take***



Check placement

Playing with her dress, but shouldn't, parents correct her position

Still focused on the TV

Demonstrate Exercises

Parents do activity with Emma

"Piano fingers!"

"Watch to make sure she is doing them correctly (like closing her eyes)

This helps calm her when doing exercises

Begin EEG scan
Close Eyes / Open Eyes

Accepting, does what she is told.

Minimal fidgeting, **but looks stiff**

Parents count - **parents very active with her exercises**

Mom holds a towel over her eyes for closing eyes

Lab tech counts

Watches Dora and talks with show

"Watch out!"

A little restless

Reassurance from mom and lab tech

"Good Zo!"

Getting tired and **fidgeting** with her dress

Dad goes to front of bed to **bring her attention** to the front

Counting down as going through exercises

Hyperventilation

Lab tech brings a pinwheel to help with hyperventilation exercises

Mom holds the pinwheel

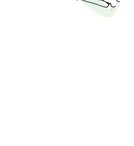
Flashing Lights

Watching show while lab tech sets up light

Uncomfortable with the **flashing lights**

Parents stand up to help

Dad puts his hand above the light **to guide her** where she should look



She holds her hands above her eyes **to block the light**

Mom helps hold her hands so they don't block the light

Lab tech **gets towels** to put next to her **to show where to put her hands**

Begin
Clean up

Parents **take a picture** after it is done

Rinse Hair & Remove Electrodes

Focused on TV

Only small reaction

Remove Gritty Gel

Uncomfortable and **restless** by some of **the gel removal**

The lab tech lets her **touch her hair to show that she is removing this sticky gel**

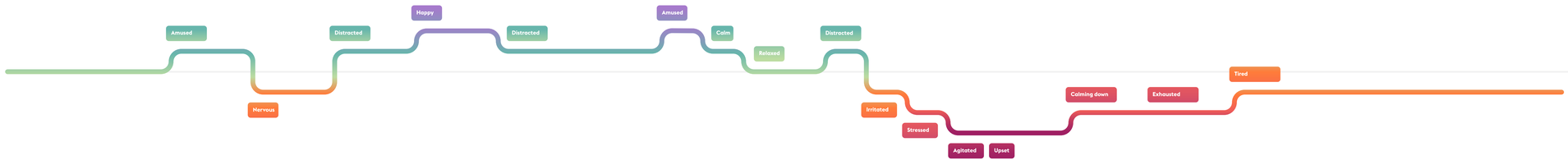
Changes topic to Frozen

After lab tech showed her then **she was more understanding and accepting of the task**

Finished!

Parents show her the picture that they took of her hair - **she hugs the phone**

Go Home



Preparation for EEG test

The **third EEG** - so mom is **prepared**

Mom brings a suitcase with stuff for Lily, an **iPad** and **snacks** are the most important items

Waiting Room

Playing in the waiting room

Greeted by Lab Tech

Two lab techs come to help with this appointment to help make it go faster as Lily has a developmental disorder

Choose a movie

Mom brought movie with her

Lab techs talk to Mom and Lily, keeping everything positive

Sit down on bed

Lab techs check her hair and takes out the ponytails, while talking to Lily

Explanation of procedure

Focused on the TV

Gives explanations to mother

"Wellbeing of the parent is important too - they should know what is going on. This helps calm the patients nerves"

Child lays on bed

Measure and mark head

Giggling, tickling feeling in hair from tape measure

Lab techs sings her a **lullaby** to her

"Higher tones help calm the children"

Demonstrate placing electrodes

Rubs Q-tip on Lily's hand to show it wouldn't hurt

Placing electrodes

Mom takes out **iPad also** to distract Lily

One lab tech holds the gel on her glove as the other is placing electrodes

"Try to be quiet and calm"

"Take your time, don't rush"

Gets **irritated** by electrodes - especially ones that are being **placed close to her face**

Mom holds Lily's legs or arms if she is moving around

Lab tech taps on the head to distract the patient as they are placing the electrodes

Continue singing

She get**s more stressed out & uncomfortable**

Mom has to continue **holding Lily**

Lab techs **sing to patient** to try to keep her calm

"Bloop Bloop went the vis"

The ones around her face seemed the most irritating - **Lily is uncomfortable kicking legs or moving around arms**

Tries to distract Lily with iPad **while also having to hold Lily's arms/legs**

Lab tech **goes to call another person to help,** but the **phone doesn't work**

Lab tech has to **go into the hall to ask another lab tech for help holding Lily** and **placing electrodes faster**

Lily is very **irritated** and **upset**, **crowded by so many people**

Another Lab tech hears what is going on and comes to help

They try to **speed up** the process as much as possible

The **other lab tech comes and helps hold Lily** and **Mom is able to grab a bottle from her bag**

Lab tech's sing along with music that is playing on the TV

Rubbing Lily's hand to help comfort her

Check placement

The **bottle helps calm down Lily**

"Lekker drinken"

There is **a lot of people in the room,** lab techs work **quickly** now that Lily is **calmer**

Exhausted after having all the electrodes placed

Arranges electrodes that are placed in a bag for Lily and **prepares for moving** to the 24 hr EEG room

Continues to be upbeat and positive with Lily and Mom

Move to 24 hr EEG room

Walking slowly and tired to next room

Mom is **carrying a lot of stuff**, the **lab tech helps carry the suitcase** so **she can hold Lily's hand**

Arrive to 24 Hour EEG Room

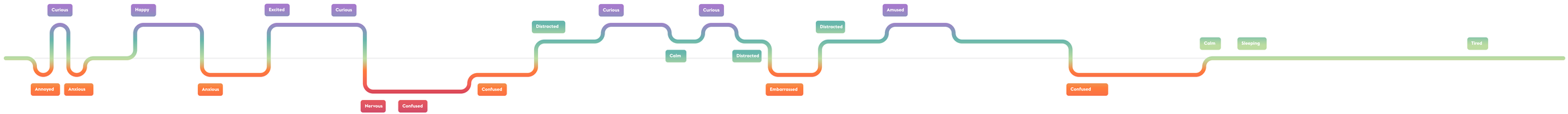
Arranges their things in the room

Lab techs have to **arrange** space, the **wrong bed** was in the room so they **switched**

Explanation of 24 hour EEG

Lab techs give **clear explanation** of the process to Mom

Arrange the cameras, cover the ones that are not in use



Preparation for EEG test

Has **seizures, but doesn't notice** when he has them, just momentary lapse in time

"More annoyed that we are looking at him"

"He always wants to ask a lot of questions, we don't keep secrets - straight forward with what is going on"

Didn't prepare exact steps of what was going to happen

"We tell him later, **as it is happening**"

Difficult for him to understand

"The wires are going in my head!"

Waiting Room

Playing in the waiting room & eating snacks

Greeted by Lab Tech

Looks anxious walking to room

Choose a movie

Happy choosing a movie

Sit down on bed

"Why do I have to go on the bed?"

Tries to lay comfortably on bed, he brought two monkeys with him

Answers his questions as he asks them

Explanation of procedure

Lots of **abstract terms** for him, hard to explain

Concerned about not knowing what is going on

Child lays on bed

Has a small seizure

Parents quickly try to get lab techs attention, but the seizure stops

Measure and mark head

Focused on the TV

Demonstrate placing electrodes

"What does it do?"

Straight forward explanation

"It will not hurt and we have to do this and this"

Placing electrodes

Child is very calm

Watches TV

Asks a lot of questions during the test

"Why is this thing here?"

"Little boys **want to know everything**"

Check placement

Watches TV

Parents **took a photo** with the electrodes

"Don't post it on Facebook!"

Worried parents

Demonstrate Exercises

Lab tech **jokes**, "If you talk too much **I'll put a sensor/electrode on your chin!**"

"I can see with infrared cameras if you are asleep or not...don't try to hide under the blanket because I'll know!

Laughs at Lab tech's jokes

Begin EEG scan Close / Open Eyes

Calm, mom sits with him

Hyperventilation

Lab tech counts down every few minutes

Flashing Lights

He has **seizures** during the exam

Parent 'excitedly' ask if the lab tech sees them - She says she sees them

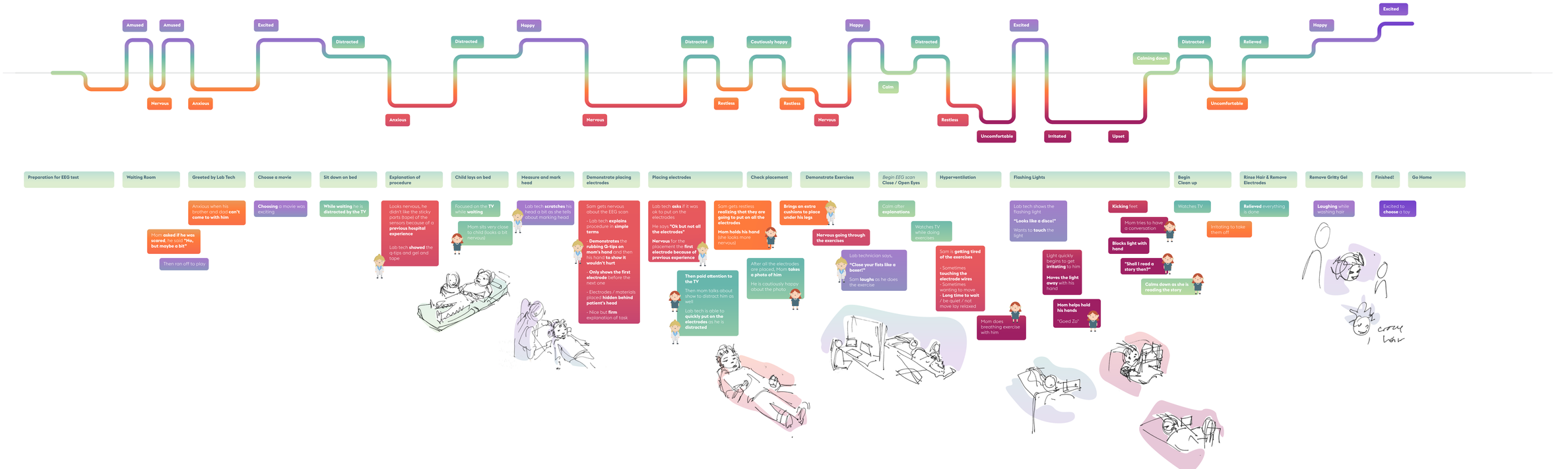
Sleeping portion of the exam

Calms down, preparing for sleeping portion of exam

Go to next appointment

Tired from long day

They go to speak with a neurologists to go over test results. Good news for him, as the seizures were affecting his learning so medication will improve that. Parents are relieved


Amused
Amused
Excited
Distracted
Distracted
Happy
Distracted
Cautiously happy
Happy
Distracted
Excited
Calming down
Distracted
Relieved
Happy
Excited
Nervous
Anxious
Anxious
Nervous
Restless
Restless
Nervous
Calm
Restless
Uncomfortable
Irritated
Upset
Uncomfortable
Preparation for EEG test
Waiting Room
Greeted by Lab Tech
Choose a movie
Sit down on bed
Explanation of procedure
Child lays on bed
Measure and mark head
Demonstrate placing electrodes
Placing electrodes
Check placement
Demonstrate Exercises
Begin EEG scan
Close / Open Eyes
Hyperventilation
Flashing Lights
Begin
Clean up
Rinse Hair & Remove Electrodes
Remove Gritty Gel
Finished!
Go Home
Mom asked if he was scared, he said "No, but maybe a bit"
Then ran off to play
Anxious when his brother and dad can't come to with him
Choosing a movie was exciting
While waiting he is distracted by the TV
Looks nervous, he didn't like the sticky parts (tape) of the sensors because of a previous hospital experience
Lab tech showed the q-tips and gel and tape
Focused on the TV while waiting
Mom sits very close to child (looks a bit nervous)
Lab tech scratches his head a bit as she tells about marking head
Sam gets nervous about the EEG scan
- Lab tech explains procedure in simple terms
- Demonstrates the rubbing Q-tips on mom's hand and then his hand, to show it wouldn't hurt
- Only shows the first electrode before the next one
- Electrodes / materials placed hidden behind patient's head
- Nice but firm explanation of task
Lab tech asks if it was ok to put on the electrodes
He says "Ok but not all the electrodes"
Nervous for the placement the first electrode because of previous experience
Then paid attention to the TV
Then mom talks about show to distract him as well
Lab tech is able to quickly put on the electrodes as he is distracted
Sam gets restless realizing that they are going to put on all the electrodes
Mom holds his hand (she looks more nervous)
After all the electrodes are placed, Mom takes a photo of him
He is cautiously happy about the photo
Brings an extra cushions to place under his legs
Nervous going through the exercises
Lab technician says, "Close your fists like a boxer!"
Sam laughs as he does the exercise
Calm often explanations
Watches TV while doing exercises
Sam is getting tired of the exercises
- Sometimes touching the electrode wires
- Sometimes wanting to move
- Long time to wait / be quiet / not move lay relaxed
Mom does breathing exercise with him
Lab tech shows the flashing light
"Looks like a disco!"
Wants to touch the light
Light quickly begins to get irritating to him
Moves the light away with his hand
Mom helps hold his hands
"Goed Zo"
Kicking feet
Mom tries to have a conversation
Blocks light with hand
"Shall I read a story then?"
Calms down as she is reading the story
Watches TV
Irritating to take them off
Relieved everything is done
Laughing while washing hair
Excited to choose a toy
crazy hair

Preparation for EEG test

Waiting Room

Greeted by Lab Tech

Choose a movie

Sit down on bed

Explanation of procedure

Child lays on bed

Measure and mark head

Demonstrate placing electrodes

Placing electrodes

Check placement

Demonstrate Exercises

Begin EEG scan
Close Eyes / Open Eyes

Hyperventilation

Flashing Lights

Begin Clean up

Rinse Hair & Remove Electrodes

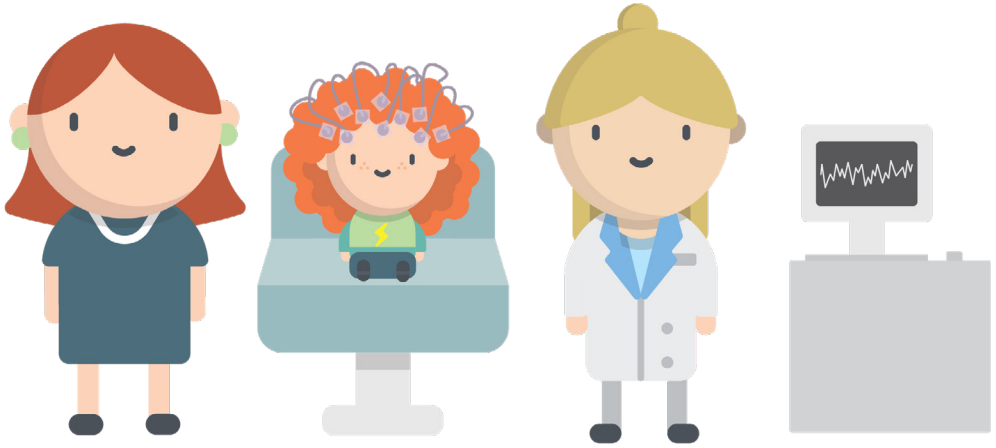
Remove Gritty Gel

Finished!

Go Home

Appendix E

Booklet & Feedback from Ideation Parent & Patient regarding seating



A Child Centered EEG Station

Hello, I'm Tina! I'm an industrial designer engineer Master's student from TU Delft and I am designing the EEG station for the future Child Brain Lab at the Sophia Children's Hospital. I have done research and observation at the hospital and have developed some initial ideas for the future space.

As I know there are many considerations and needs from the healthcare providers, parents, and the child-patient to the space, I would like to get your expertise and feedback on these beginning ideas! Extra comments on why the design would work or not work (and why!) is especially helpful for developing the design.

This part of the project is focusing on the seating of the EEG station and so you will be asked to rate the concepts and give your feedback on seating options.

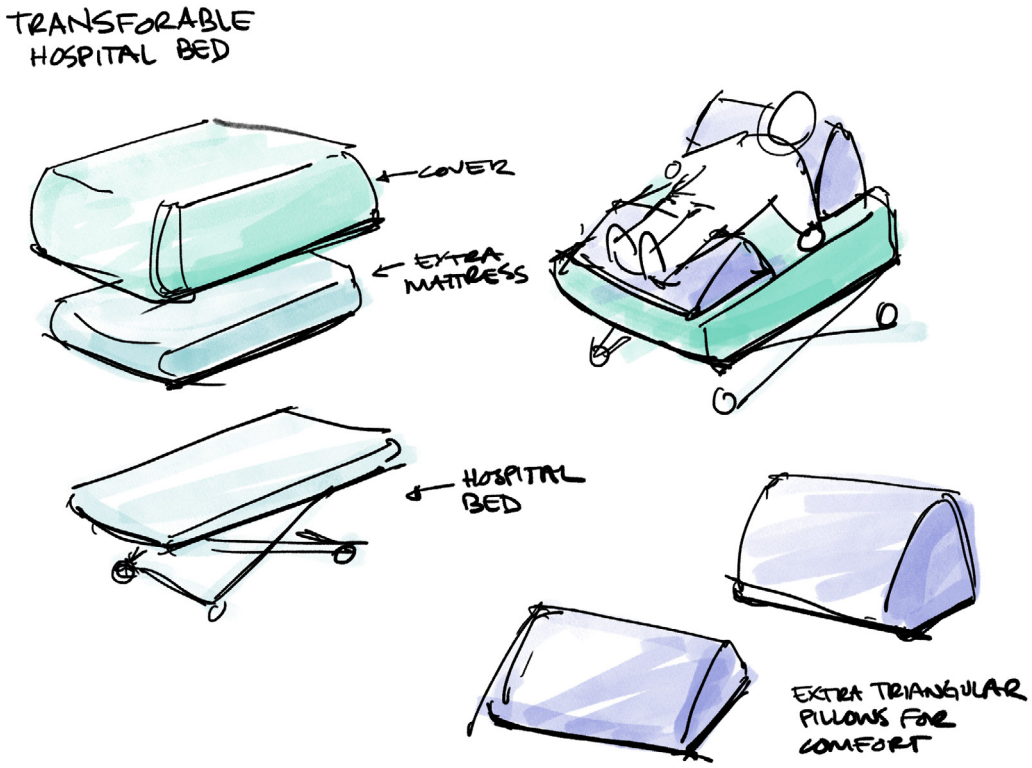
If you have any questions or comments please contact me at:

[redacted]

Thank you for your help!

Tina

Adjusting Traditional Hospital Bed



Rating

Comfy **Stiff**

My child would be able to sit for an EEG scan

My child would get restless after sitting a while

Playful **Serious**

My child would be excited to sit in this seat

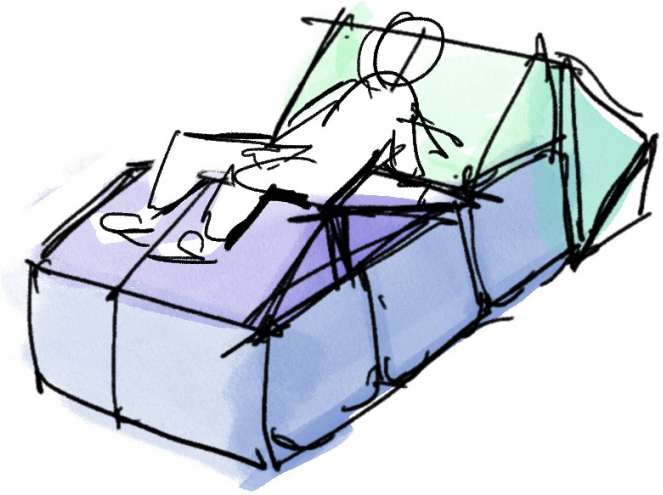
My child would be nervous about sitting for an EEG in this seat

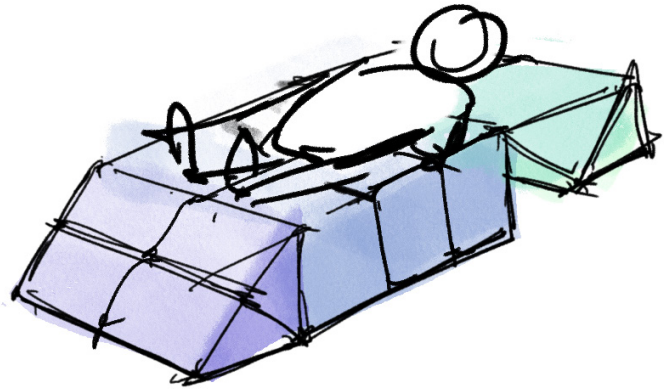
Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

the bed is an improvement to the standard hospital bed that is for adults (often too big, no confinement so the child feels less secure / safe). The position seems comfortable (and removes some pressure points) but does force the child to continuously lay in the same position. We wonder if that is pleasant for the children.

Transformable





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My child would be excited to sit in this seat

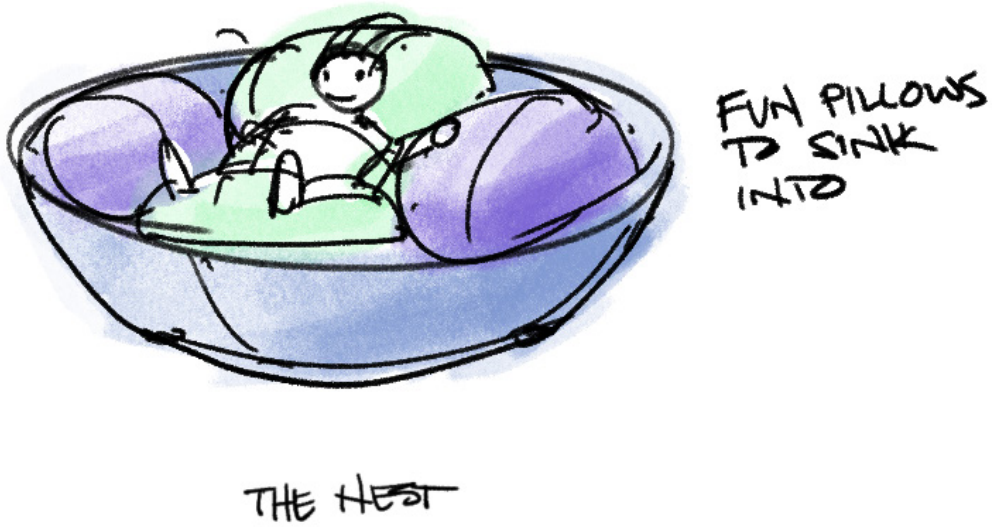
My child would be nervous about sitting for an EEG in this seat

Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

This bed looks more inviting due to the playful design (the block structure). The nice thing is, is that its easily positioned into multiple positions. Nice use of colors is inviting for children. Abe looked with us also and picked this design, something that we already expected :-)

The Nest



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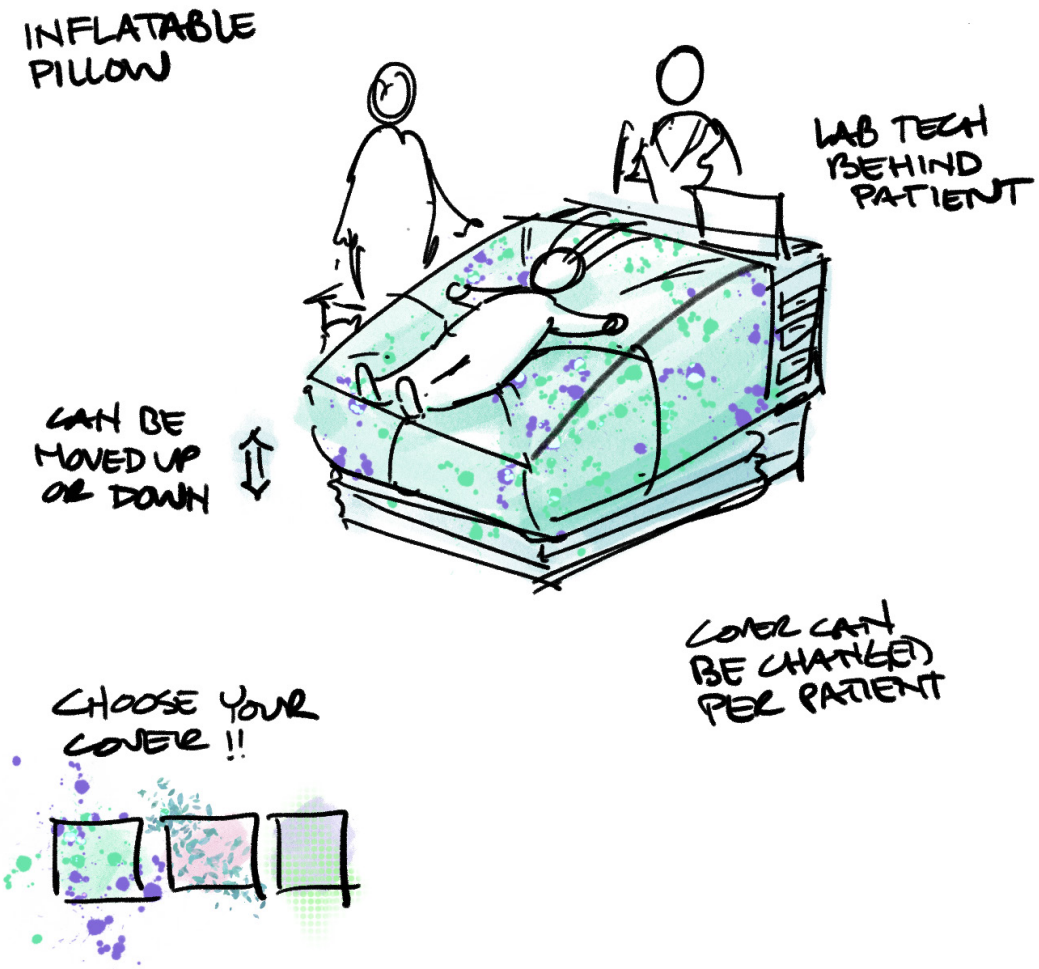
Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

This bed surely triggers curiosity with the child. It's a fun idea [leuk bedacht?] and looks playful. It is important however that parents can still easily reach the child for when it needs to be comforted

Inflatable Pillow



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Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

The idea is fine and undoubtedly triggers curiosity. Tough the design is a bit static because it is square-ish. Perhaps, a different form could come across as more friendly.

[Paul: I do not think they got that this concept is inflatable, i would ask this during the interview]

Transformable

Rating

Comfy **Stiff**

My child would be able to sit for an EEG scan

My child would get restless after sitting a while

Playful **Serious**

My child would be excited to sit in this seat

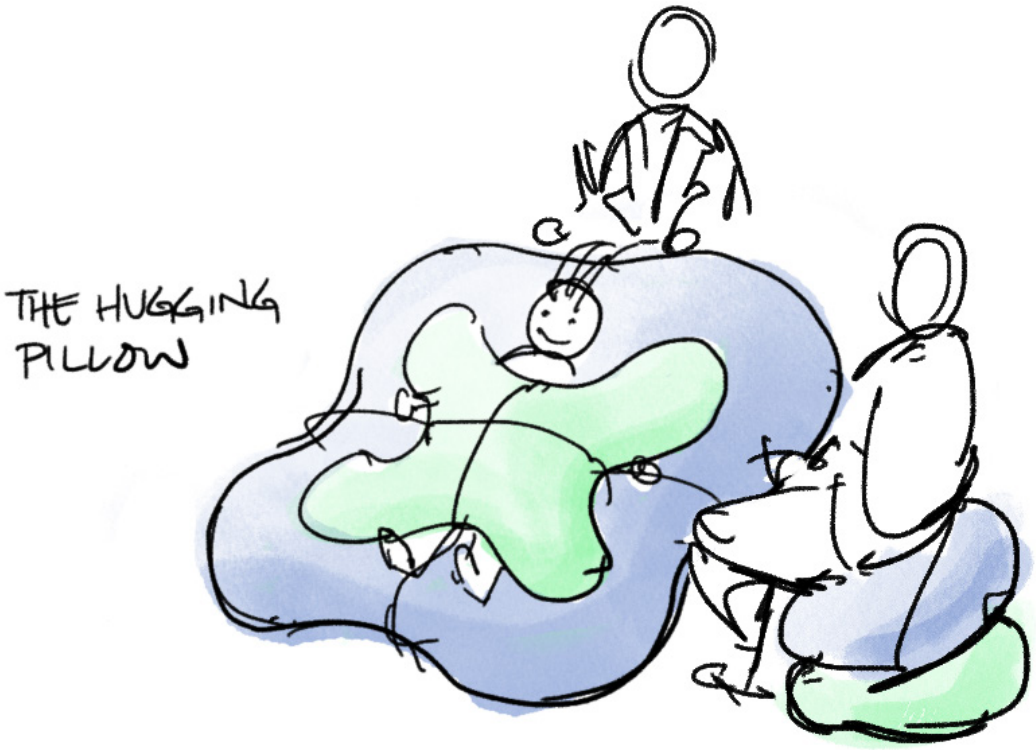
My child would be nervous about sitting for an EEG in this seat

Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

We think that in this ''bed'' (in any case) our child will have to much stimuli and is not invited to lay still.

Hugging Chair



Rating

Comfy **Stiff**

My child would be able to sit for an EEG scan

My child would get restless after sitting a while

Playful **Serious**

My child would be excited to sit in this seat

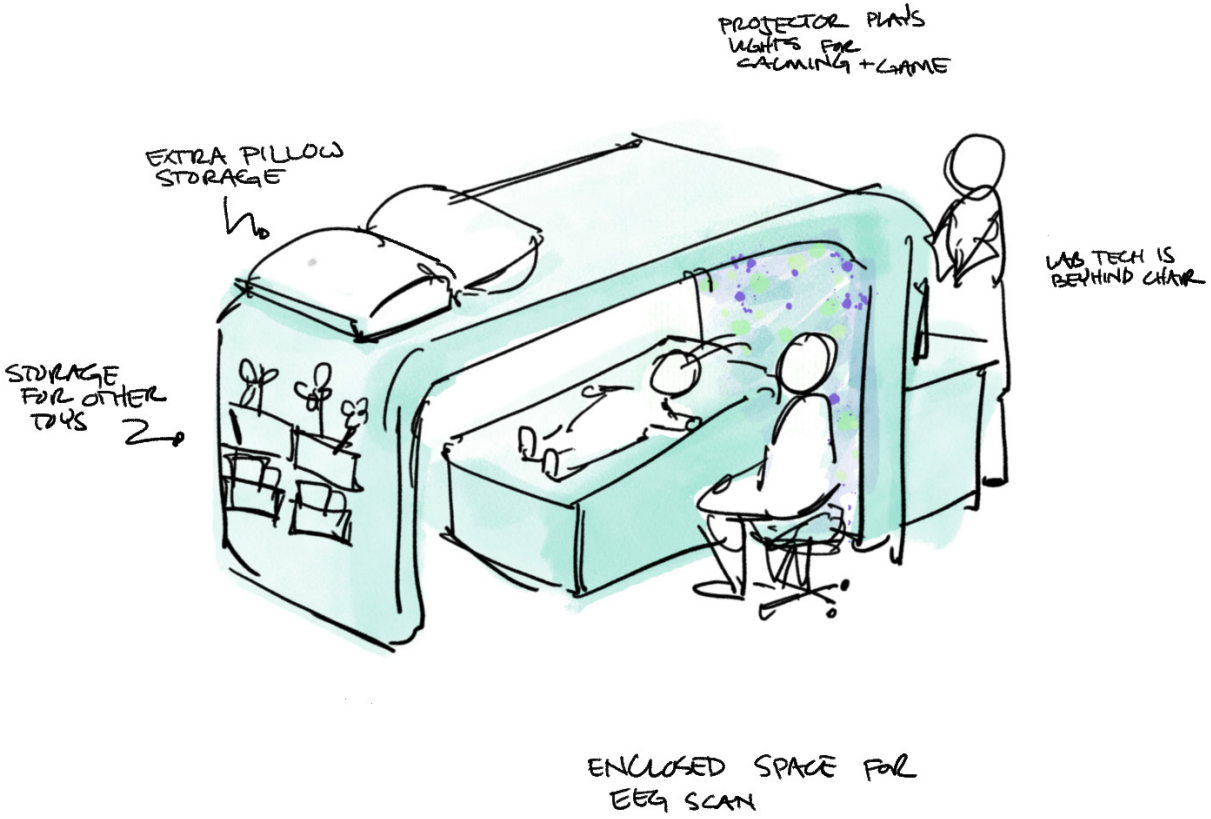
My child would be nervous about sitting for an EEG in this seat

Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

For very young children, it could be nice to feel some confinement (and therefor some safety) in the form of a pillow or something. For older children, it might be a bit to much: it is on top of everything else they must do during an EEG. Our son would wonder why the pillow has to lay on top of him

Enclosed Space



Rating

Comfy — **Stiff**

My child would be able to sit for an EEG scan

My child would get restless after sitting a while

Playful — **Serious**

My child would be excited to sit in this seat

My child would be nervous about sitting for an EEG in this seat

Further feedback:

Why or why not do you like the seating? Do you think your child will find it comfortable or interesting? Any other comments or feedback is interesting!

We associate this design with a CT/MRI scanner and think this is a negative association for on our son. It looks to much like a clinical test setting.

[Paul: wondering if they noticed the projecting lights]

Ideation Feedback Notes

- Parents were **surprised and happy by the amount of change**
    - *They see the need for change*
- Because children in this situation have a lot of trauma
- [redacted] had to have parts of his skull removed and attached)
- **The whole setting is turned into a traumatic experience**
- They have a lot of **fear associated with the space**
- They have to prepare a lot for the visits
- More **comfortable** for not only the first visit, **but the 10th / 15th visit**
- **Fearful** of
    - of needles
    - the clinical staff - **all the white /uniforms**
    - **"Why do the lab techs need to wear this?" - Mom**
    - "You aren't doing anything dangerous" - Mom
    - **This only makes Abe extremely nervous**
- A "**Home setting**" would make the space better
    - **Lighting is too bright in the EEG**
    - Books
    - Colors
    - Child stuff/toys
    - 3 years old was his first time going

- [redacted]loved choosing the movie - **he had something to choose!**
    - **Gives him back some control**

Fearful of

- **The hospital bed is very central in the room**
    - **Ominous**
    - **Clinical**
    - **That's where you will go and they will do stuff to you**

Seating

- Some to move / **option to move**
- **His only view is of the ceiling**
- It may be nice to sit up and see the whole room
- **He didn't like not being able to see what the lab technicians are doing**
    - Having a mirror to see what they are doing is beneficial
- He always wants to know everything

Preparation

- They do a lot of preparation because of his previous experiences / trauma from the hospital
- **Showed him a video of another hospital to show the procedure**
- Didn't really explain of what is happening in his brain
    - "It will be a series of test where, this and this will happen"

Appendix F

Feedback from Healthcare Providers

Neurologist Meeting
Questions

How long the EEG will be?
Which excursuses will they be doing?
Which kinds of children are coming to the exam? - mostly ones with seizures / some brain development issues / no 24 hr EEGs

- Because EEG won't be for diagnostics
- To gather information about the EEG brain networks / brain connectivity
- You gather information about the EEG and it doesn't matter what the child is doing / not doing
- then get an idea of what kinds of the brain is active - to learn more about the network for the brain function
- have a registration of 10-15 minutes - doesn't matter what happens in that period - we will use the data anyways
- make the process easy and as comfortable as possible
- Eye tracking could be a task to do during the EEG
- Makes it more fun for the child to make the EEG
- If I was 16 - when your brain is active you get all these currents from your brain which you can see on the outside from the electrodes - measure the electric activity on your head, you don't have
- standardized setting / emotion / feeling
- it may be complicated with all these different children
- what is the result as doctors / researchers conclusions:
- Do we see any difference the child is 6, 8 etc.
- No feedback on child health measurements
- Some feedback but not really meaningful (yet)
- Easy / simple measurements
- Eye tracking - more suitable to get a nice result from
- Could be that they are sitting - important that the child is relaxed
- Movement / muscle activity / even from frowning/chewing effect the EEG - gives artifacts on your EEG
- We need the child to feel comfortable -
- We may not be doing those exercises!
- "Relaxing"
- We are looking for EEG caps that are easier to put on
- EEG nets - soak in water and electro light solution and then manipulate a little bit
- A faster process / less painful annoying to children
- Quicker - hope to set it up in 15 minutes - entire process 30 minutes (but we will see how it goes)
- 15 min prepare - put on the cap, put the child at ease, etc
- Depends a bit on the child - some children prefer to sit close to their parents, some like to lie down, some like to sit
- Eye tracking
    - You have these cameras that can track your eye movement
    - Cameras set on top of screen
    - Depending on task there is something is happening on the screen
    - Notice whether the child is following the thing on the screen
    - Also can ask the child to look at a specific activity (look at all the muppets)
    - Look at a ball, with their eyes try to move the ball to the other side of the screen (
    - You can derive if there is any visual processing thing going on, attention span, memory,
    - EEG measurements and eye tracking
    - Pre req to do the testing rather than assessing the visual function
    - Goal or timer?

- Snoelezen room / no moving around
-

Meeting with Drs and / Lab technicaions
26.05.20

- “Brain lab is supposed to be fun”
- Choose lighting and colors and projections is nice
- Feeling of being in control
- ENvironmental choice - children should choose what they need
- How you explain the EEG?
    - WIres for your head
    - Measure waves
    - Nice waves form
    - You can see the different parts of the brain talk to each other
- Concerns
    - Robustness
    - CLeaning
    - It should be applicable for different ages
    - Gap could be more clear
- Integrate the chair into the appointment more
- Or integrate the table more into the appointment?
- They should be able to sit comfortably
- Make it interactive
- Parents contact is important
- Get a reward for sitting
- In the CBL there shouldn’t be a movie

Appendix G

Technology comparisons

Interactive Display vs Projector

Technology Needs To

1. Display visuals / videos of the procedure
2. Play the game: Detect electrodes being placed and respond
3. Transition into each step of the procedure (easily by the lab tech pressing a button)
    - Let this be able to be changed based on the lab technicians needs during the procedure
4. When the game starts, smooth activation
5. When the electrodes are detected being placed, then it shows the visual of the brain sending data

Electronics with 60 hz can create artifacts on the EEG, affecting the reading [1]. Though if placed far enough from the EEG, such as the TV that is in the traditional EEG room, then it should not affect the EEG reading.

Area	Interactive Display	Interactive Projector
What it is	Display that can be touched	Projector + white space Enables interactive by tracking movement by infrared or DLP technology (more on DLP below)
Responds to	Touch	Finger and/or pen (that transmits infrared signal to projector)
Response time	Better response time generally	0.1s
Visibility	Images tend to be better	Projected images tend to be less bright (resulting in eye strain) Brightness & quality of the projection tends to diminish over time
Surface	Requires only the interactive display to be embedded into the table	Can be used on almost any surface
Durability	Requires durable glass to be used (e.g. diamond glass) - at a cost	Can be used on many surfaces, so the surface can be replaced easily
Cleanability	Requires design that limits dirt being stuck in cracks	Can be used on a smooth surface that can be easily cleaned

Transportability	Can only be used on one table	Any surface could be used
Affecting EEG	Could highly affect EEG as it is very close to child	If projector is placed above the EEG, it could be out of the way so as not to affect the reading
Cost	Interactive Restaurant table - ~$1500 [2] But if it	Omivista interactive projector ~$2000 Xbox Kinect

Area	Interactive Display	Interactive Projector
Response time	++	+
Visibility	+	-
Durability	-	++
Cleanability	-	++
Transportability	--	+
Affecting EEG	--	+

DLP

“DLP stands for 'Digital Light Processing', DLP Technology was invented by Texas Instruments. The picture in a DLP projector is produced by light reflecting off a Chip which has millions of tiny mirrors fixed on it. This chip is commonly known as a 'Digital Micromirror Device' or DMD. Each mirror in the DLP projector's DMD Chip represents one pixel in the digital image, so for example, in a HD DLP DMD chip there will be 1920x1080 or a little more than 2 million mirrors assembled on the tiny DLP DMD Chip. The DLP chip mirrors vibrates or wobbles to either reflect the light beam to the final image or rejects the light falling on it.”

References

[1] EEG. (n.d.). Retrieved August 12, 2020, from https://www.medicine.mcgill.ca/physio/vlab/biomed_signals/eeg_n.htm

[2] 32" Interactive Restaurant Touch Screen Table—Buy Touch Screen Table,Restaurant Table,High Quality Waterproof Table Product on Alibaba.com. (n.d.). Retrieved August 12, 2020, from https://www.alibaba.com/product-detail/32-interactive-restaurant-touch-screen-table_60636485225.html?spm=a2700.7724857.normalList.2.1d752b97iD1UQ3&fullFirstScreen=true

[3] Interactive Projectors—The End of The Boring Boardroom! (n.d.). Points West Audio Visual. Retrieved August 12, 2020, from http://www.pointswestav.com/blog/news/News/2015/08/10/35:interactive-projectors-the-end-of-the-boring-boardroom

[4] Interactive Projector vs Interactive Display (Which is better?). (2018, May 8). Avocor | Different by Design. https://www.avocor.com/blog/interactive-projector-vs-interactive-display-which-is-better/

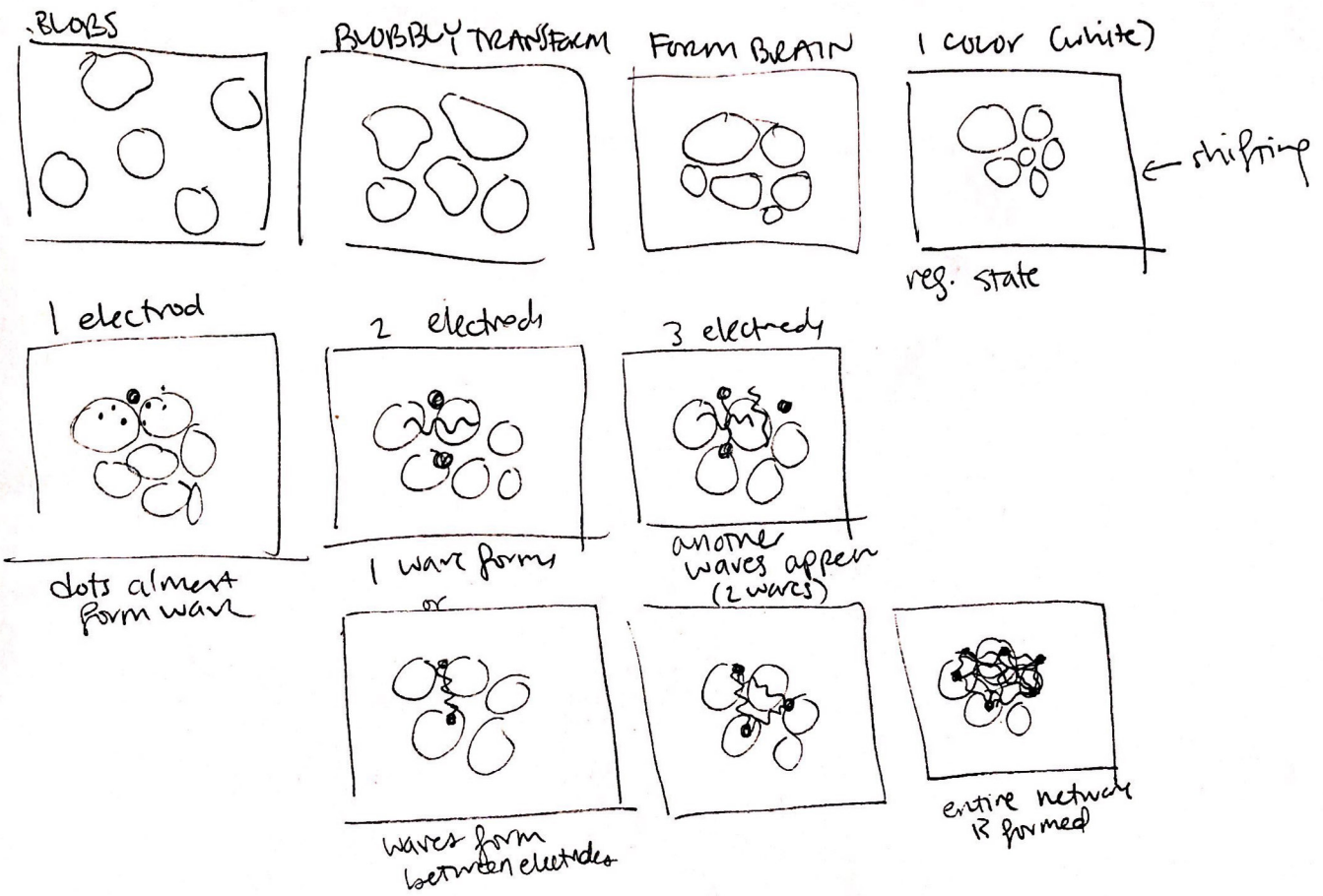
[5] Interactiefsnoezelen.nl—OmiVista · rdgKompagne. (n.d.). Retrieved August 12, 2020, from https://rdgkompagne.nl/interactiefsnoezelen/omivista/?gclid=CjwKCAjwztL2BRATEiwAvnALcrRhPxCToJ8Fk6qaerLv58LJMdJ57zuIZ5Z4Aem8bk2vlL2c3EZllxoC45wQAvD_BwE

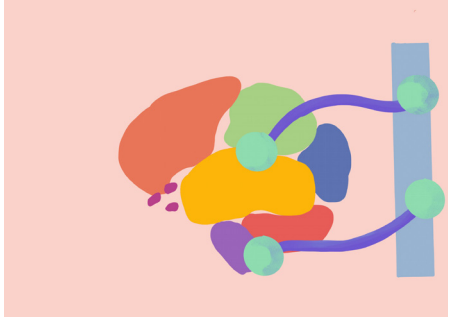
						
	Sony Xperia	**Touchjet Pond**	**Breeze Creative: epson short throw projector + sensor**	**Omi Interactive Display**	**Tovertafel - prototype kinect + projector**	**GoTouch Beam**
Description	From Sony, mixed reviews on visiblitiy		Musuem exhibit		The prototype used kinect sensors and projector	Indigogo Campaign
Size of Device	15cm x 7cm			W 7 0 x D50 x H101/130cm	34 x 38 x 24cm	
Size of Image	23in w/ touch (up to 80in for viewing)	20-80 in (touch screen up to 80		1.6m x 1.0 m		120"
Resolution	720p			4000k		720p HD
Lumens	100	80		2000		3500 lumens projection power
Visiblity in daytime	Not good visiblity - in ambientant light it can get by			Bright		Brighter than others
Transportablity	Small and easily moveable	Small and easily moveable		Has wheels	Has to be hung in one spot (can be removed and reattached)	
Speaker?	Integrated					Yes
Stylus or finger touch	Finger touch	Stylus touch		Both	Finger	
Projection type	13MP camera and infrared sensor	Infrared?				DLP
Camera						
How much power does it produce?						
Power source	Built in battery (full brightness for 1 hr)	Built in battery (full brightness for 1 hr)				3hour battery
Orientation	Can switch depending on orientation (wall / table /etc)			Onto table or floor		Can autofocus for clear angled projection
OS Software / how to run the game		Android OS built in		Has own software/apps it runs		Built in android, can mirror iphone, has apps and things already loaded, and ports to input own device
Multi-touch	10 points touch	4 points touch		Yes		4K Ultra HD sensor
Cost	$1,299	$599.90				$599.99 ($25 on campaign)
Websites / Reviews	https://www.whathifi.com/sony/xperia-touch/review	https://www.touchjet.com/2017/10/30/comparing-touchscreen-projectors/				https://www.indiegogo.com/projects/gotouch-beam#/

Appendix H

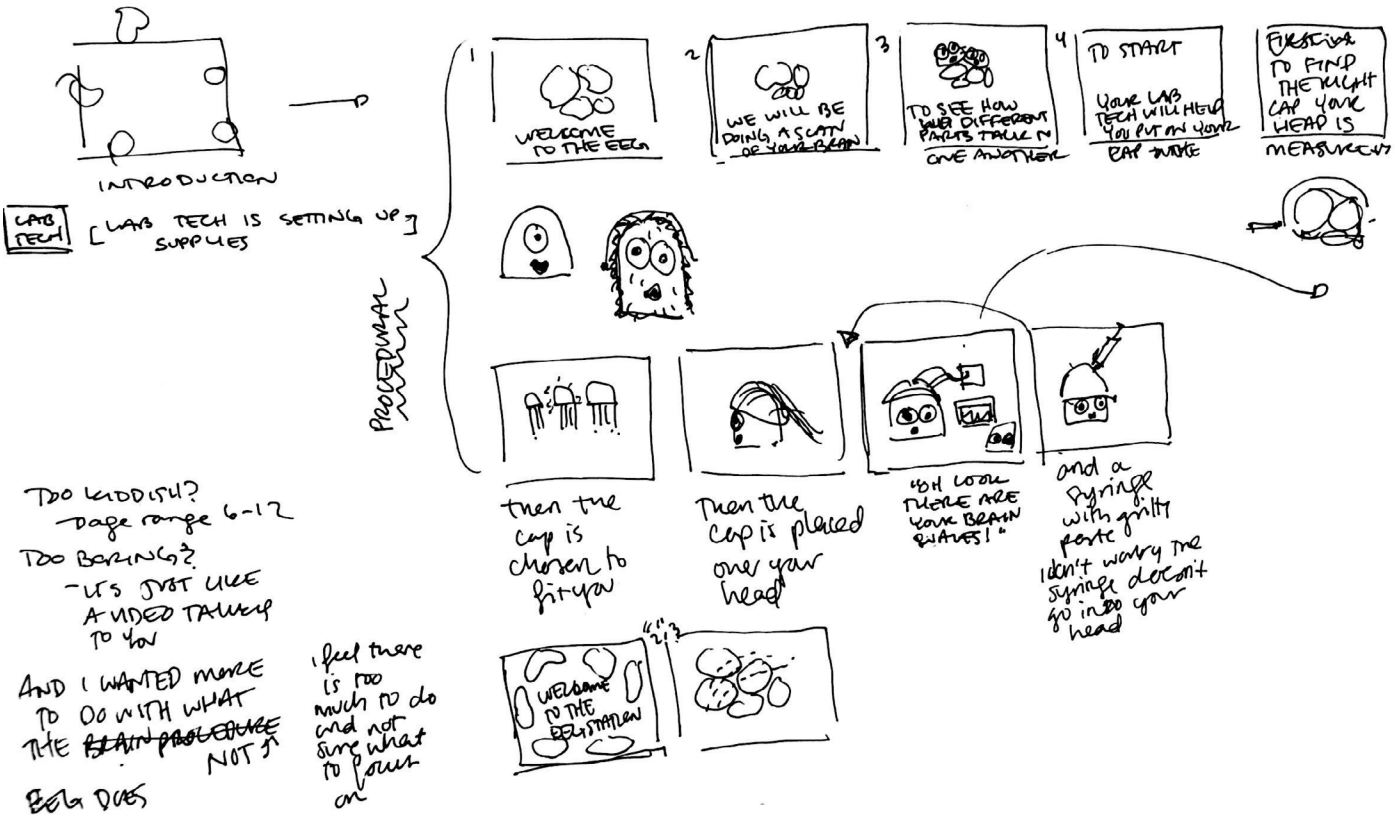
Exploration of Virtual Elements

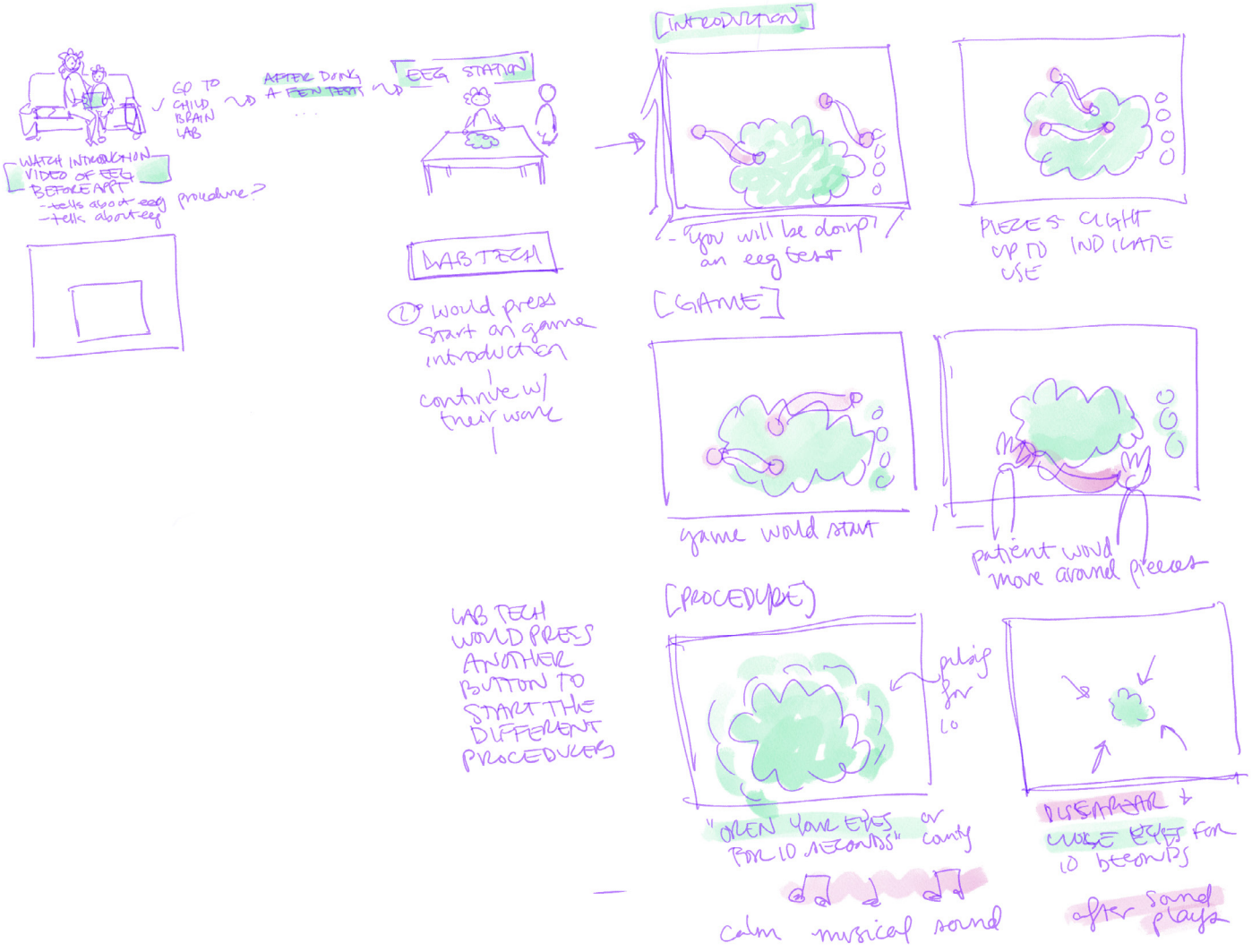
Exploring virual elements

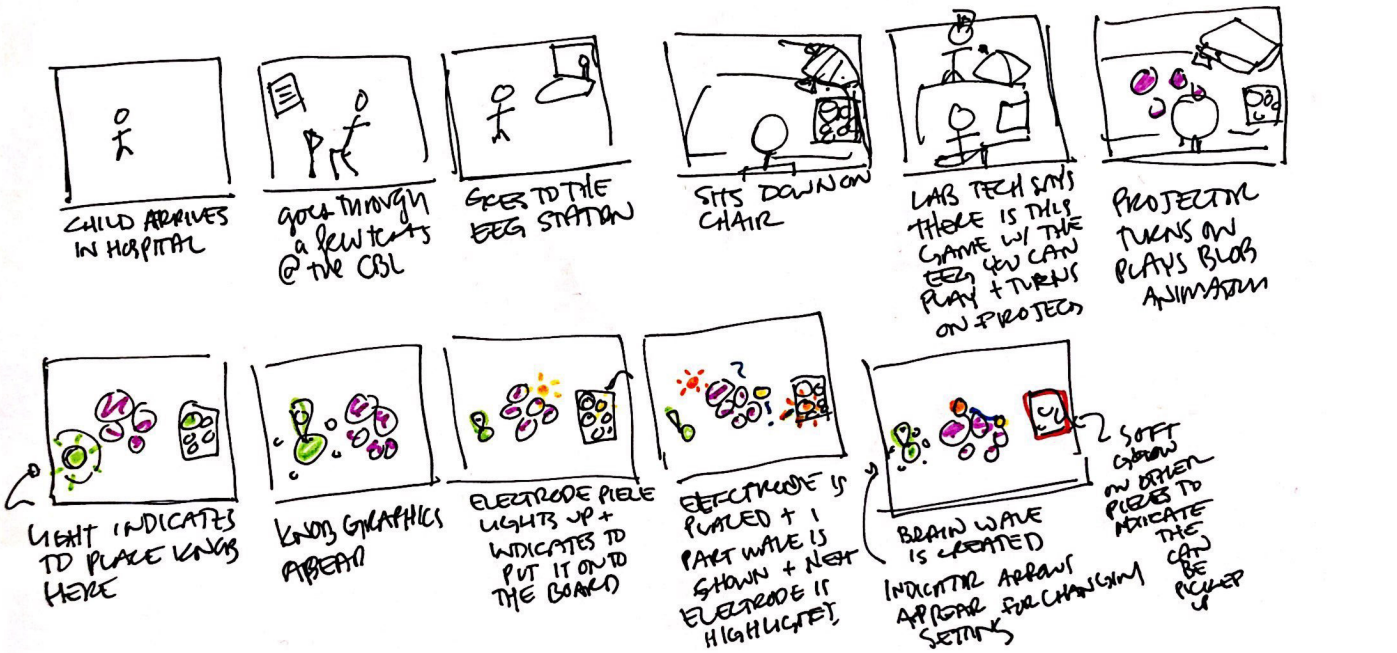


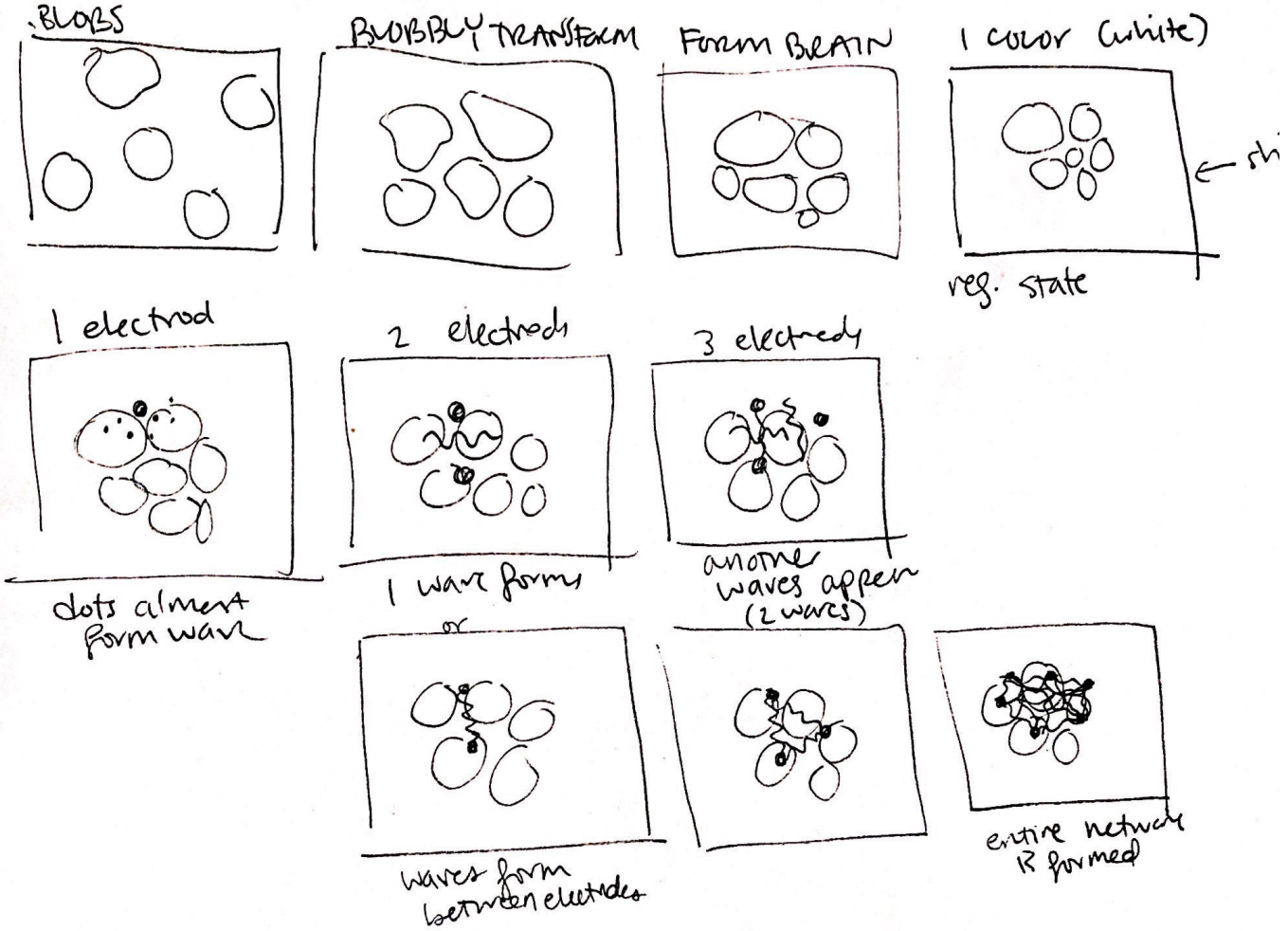


Exploring virual elements




GO TO CHILD BRAIN LAB
AFTER DRINK & PEN TEST
EEG STATION
WATCH INTRODUCTION VIDEO OF EEG BEFORE APPT
-tells about eeg
-tells about eeg procedure?
LAB TECH
① would press start on game introduction
continue w/ their work
[INTRODUCTION]
- you will be doing an eeg test
PIECES GLOW UP TO INDICATE USE
[GAME]
game world start
patient would move around pieces
LAB TECH WOULD PRESS ANOTHER BUTTON TO START THE DIFFERENT PROCEDURES
[PROCEDURE]
pulsing for 10
"OPEN YOUR EYES" or county
DISAPPEAR & CLOSE EYES for 10 seconds
calm musical sound
after sound plays


CHILD ARRIVES IN HOSPITAL
goes through a few tests @ the CBL
GOES TO THE EEG STATION
SITS DOWN ON CHAIR
LAB TECH SAYS THERE IS THIS GAME W/ THE EEG, U CAN PLAY + TURNS ON PROJECT
PROJECTOR TURNS ON PLAYS BLOB ANIMATION
LIGHT INDICATES TO PLACE KNOB HERE
KNOB GRAPHICS APPEAR
ELECTRODE PIECE LIGHTS UP + INDICATES TO PUT IT ON TO THE BOARD
ELECTRODE IS PLACED + 1 PART WAVE IS SHOWN + NEXT ELECTRODE IS HIGHLIGHTED
BRAIN WAVE IS CREATED
INDICATOR ARRAY APPEAR FOR CHANGING SETTINGS
2 SOFT GLOW ON OTHER PIECES TO INDICATE THEY CAN BE PICKED UP


.BLOBS
BLOBBLY TRANSFORM
FORM BRAIN
1 COLOR (white)
reg. state
1 electrod
dots ailment form wave
2 electrods
1 wave forms
3 electrods
another waves appear (2 waves)
or
waves form between electrodes
entire network is formed

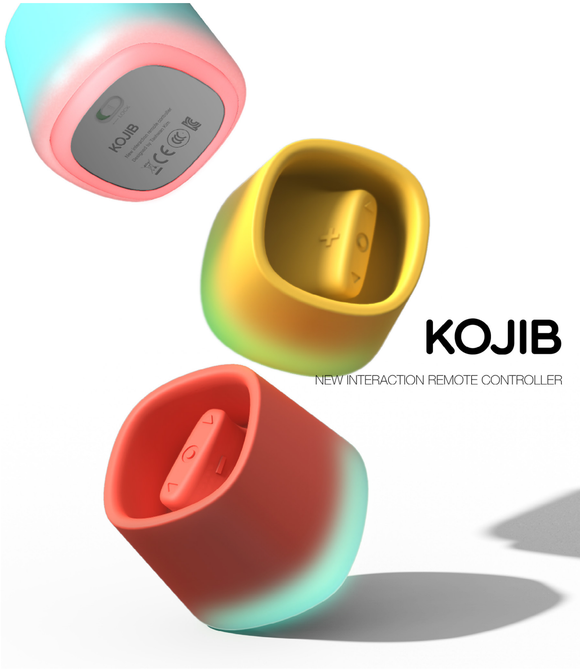
Appendix I

Physical Pieces Exploration

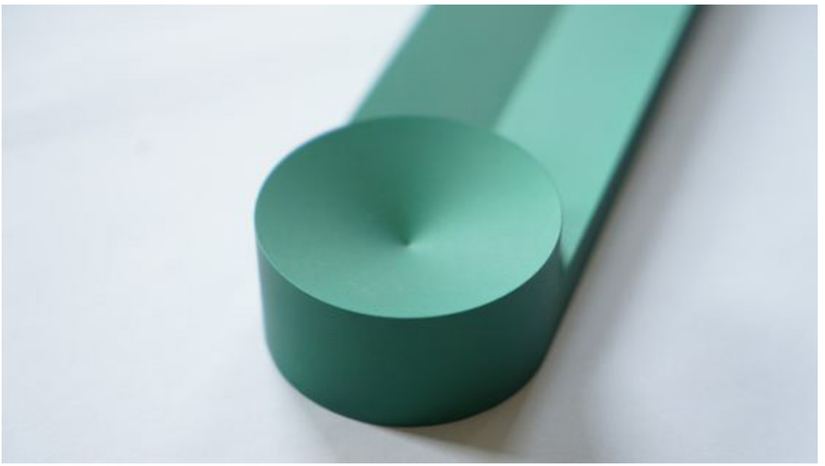
Moodboards
Sketches

Cozy

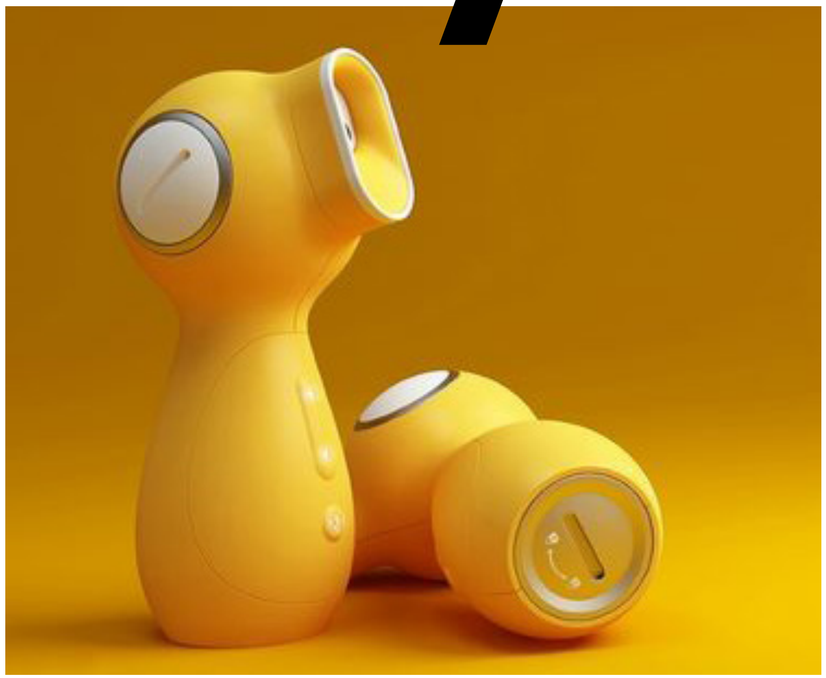
Soft

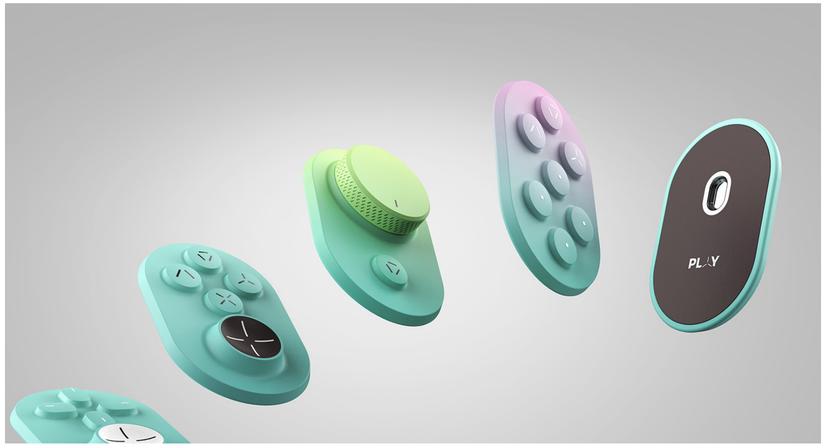


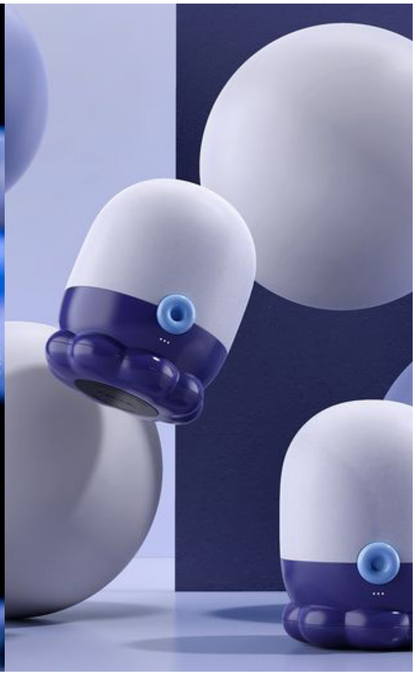
Tactile



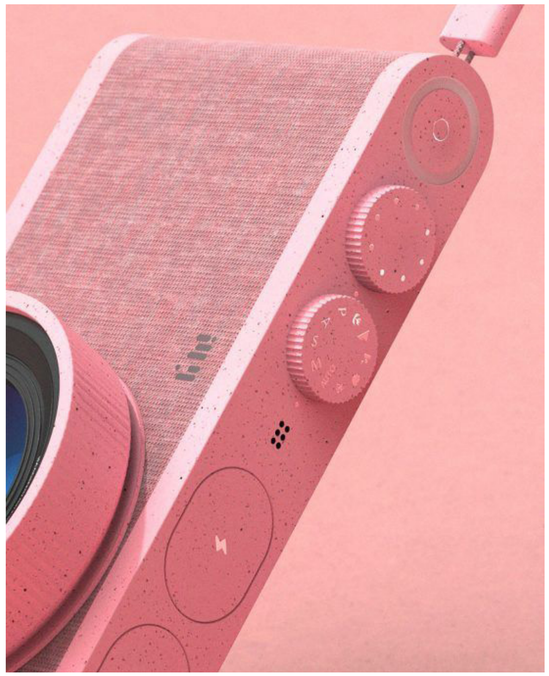
Playful



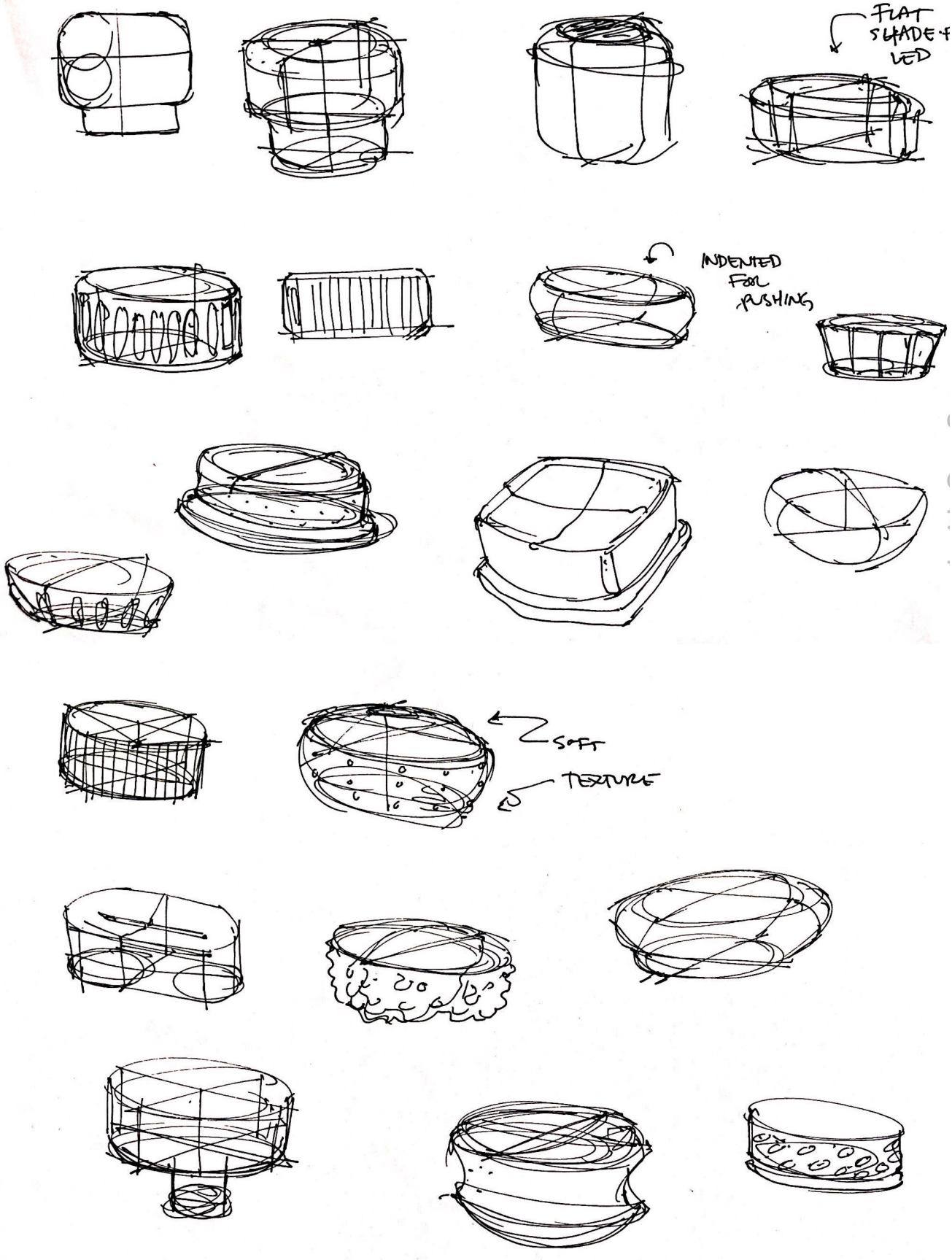




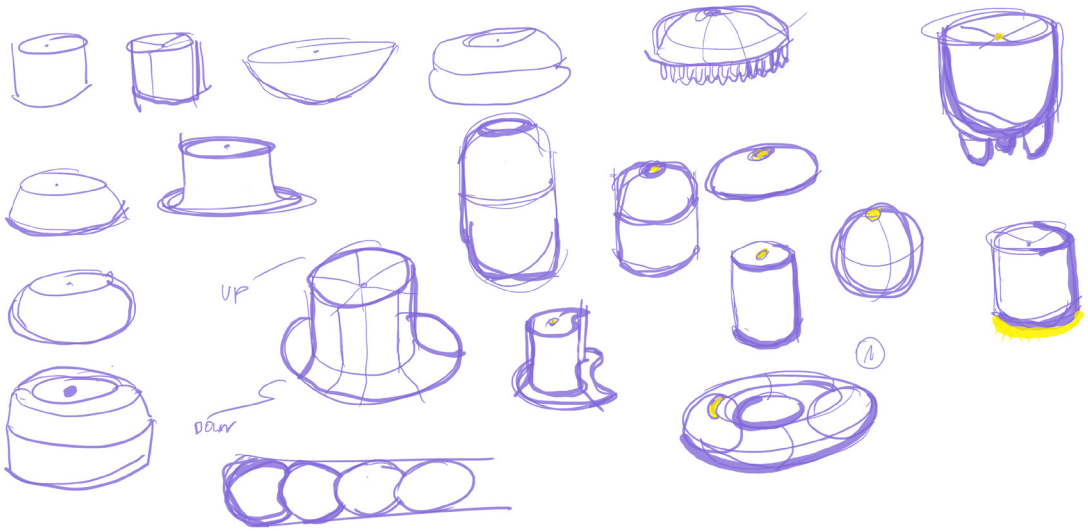
Mix

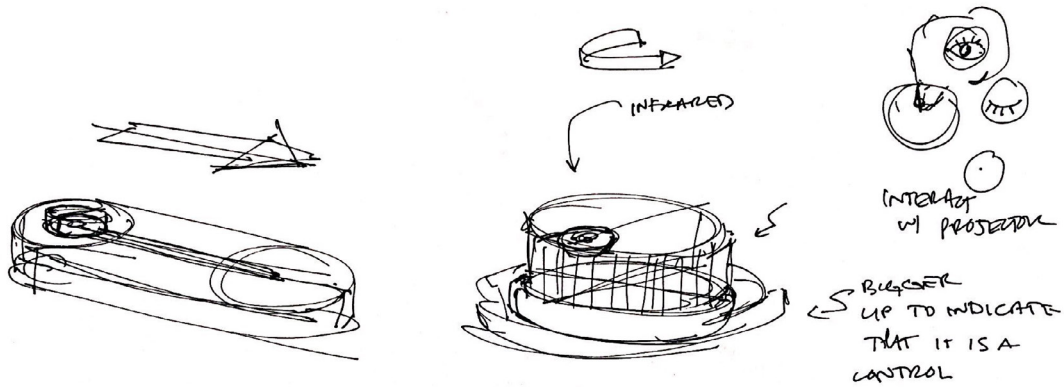


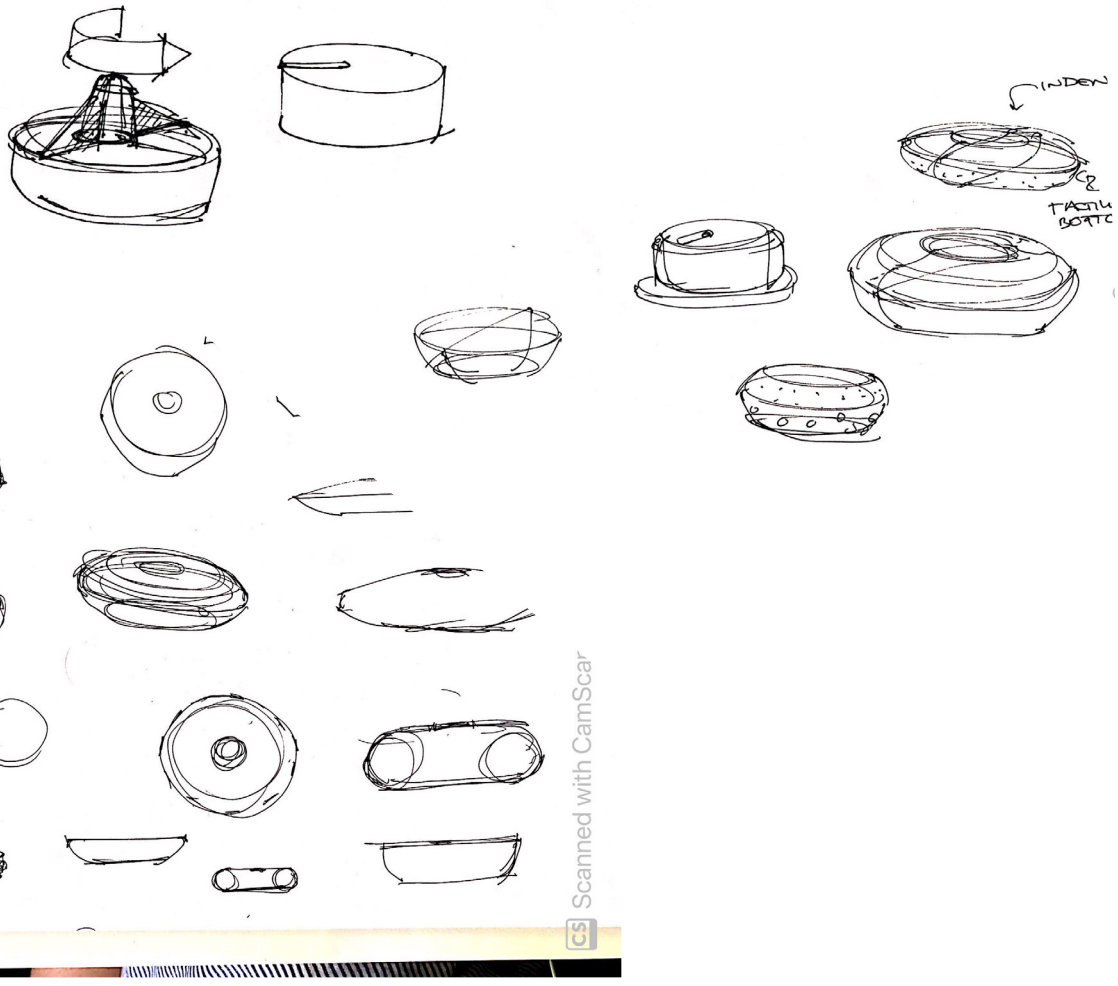
Electrode Sketches



Knob Sketches



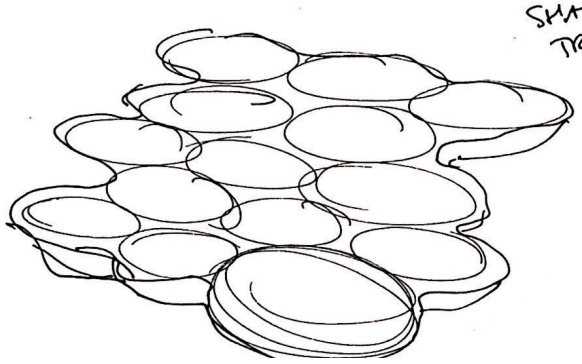




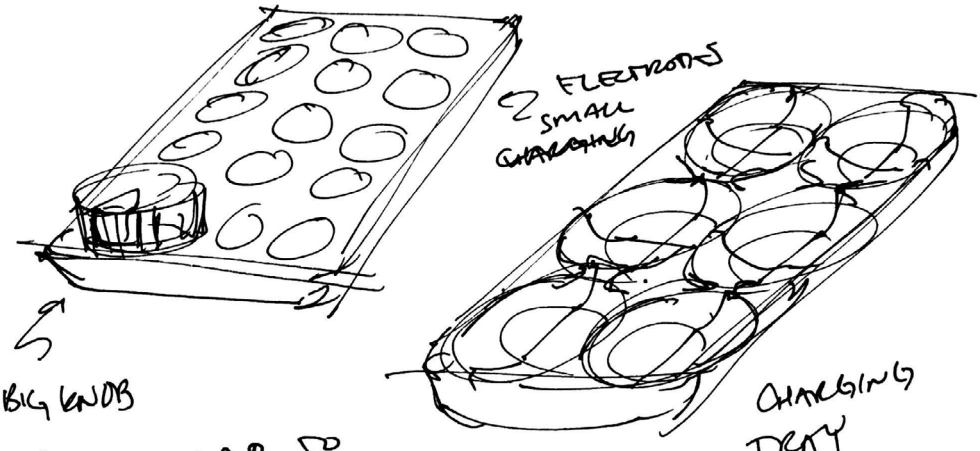
CONTROL

TRAY — SIMILAR TO ONES PPL HAVE (FEELING of CONTROL)

IRREGULAR SHAPED TRAY



CONTROL



TRAY — SIMILAR TO ONES PPL HAVE (FEELING of CONTROL)

Appendix J

Evaluation with Experts - Booklet & Set up

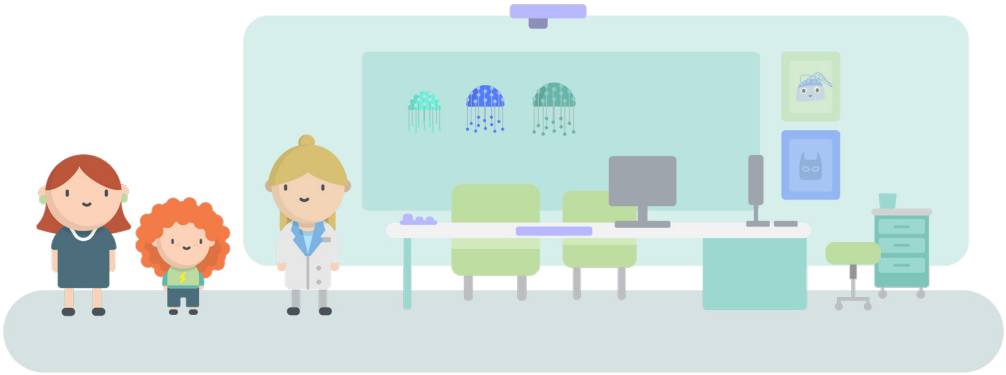
EEG Game Evaluation

Thank you for helping evaluate the EEG game design. Your expertise and critical feedback are very helpful in improving the design.

What are 3 words that you think that help describe the EEG game? Circle three or write your own if it isn't here.

Fun	Boring	Tense	Surprising
Confusing	Cozy	Complicated	Exciting
Friendly	Simple	Explorative	Sad
Abstract	Tiring	Frustrating	Playful

The Space

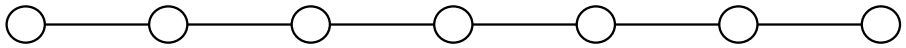


How do you think a shared space would affect your (lab technicians) workflow?

What benefits do you see? What difficulties do you imagine?

Workflow

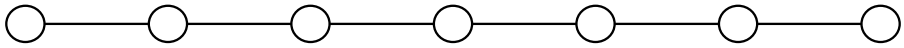
Would the EEG game fit into your (lab technicians) workflow? (E.g. setting up the space and placing the EEG cap)

Would fit in well to my workflow  **It would create a lot of extra work for me**

Why?

Understandablity

How understandable do you think the EEG game is to play for the first time?

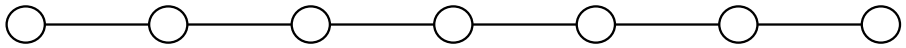
Children could play it on their own or with the help of a parent  **A lab technician would need to step in and help**

Why?

Conversations

Do you think this game could help having conversations with children about the EEG?

It would help to explain parts of the EEG to children



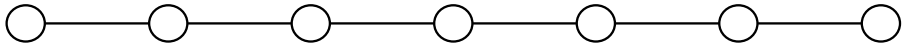
It would make conversations & explanations more difficult

Why?

Relating to the EEG

Do you think this will help children feel more safe or more nervous about the EEG test?

Safe



Nervous

Why?

Feeling Safe

Do you think this will help children feel more safe or more nervous about the EEG test?

Safe ○——○——○——○——○——○——○ **Nervous**

Why?

Affecting EEG

Do you think that playing the game would overstimulate children and affect the EEG results?

Will be a calm activity ○——○——○——○——○——○——○ **Will overstimulate children**

Why?

Playfulness

Do you think children will like playing the game?

Playful ○——○——○——○——○——○——○ **Boring**

Why?

Do you have any improvements, recommendations, or changes to the EEG game?

Do you have any other comments or feedback about the EEG game?

Thank you for your feedback!

Appendix K

Evaluation with Experts - Notes & Results

Hospital Evaluation

June 30, 2020
Who: With Head Lab Technician and 2 Neurologists

Procedure:

Parts of the research and ideation were shown to give a background of the reasoning of the design. Then a description of the space was shown. Afterwards, a walk through was done of usage storyboard, followed by showing the visual effects, and of the demo of the interactive game. Questions were asked about the different areas of the design and an open dialogue to discuss feedback and possible improvements to the design.

Initial Reactions

- "Something new and different"

Interpretation

The initial reaction to the EEG game was positive and a bit surprised. The game is different from the traditional way of watching TV.

The Space

How do you think a shared space would affect your (lab technicians) workflow?
What benefits do you see? What difficulties do you imagine?

- "It shouldn't be difficult"

Interpretation

The lab technician wasn't very concerned about the EEG station being a shared space.

Workflow

How would the EEG fit into the lab technicians workflow?
What concerns do you have about the game? What benefits do you see in having a game?
Do you think that the game will be able to be played while you (lab technicians) are placing the EEG cap?
What moments do you anticipate that you will need children to stop playing the game?

- The measuring of the head should happen before the game starts
- First the cap could be chosen from the wall
- We measure and know which one
- This [the game] could be incorporated into the selection of the cap
- Then the child is free to play
- It would also be nice if the game incorporated the eyes closing exercise
- “It's better that a game tells them to close your eyes than a lab technician”
- “As long as you have music you have to keep your eyes closed”

What benefits or difficulties do you see in having children play this game vs the traditional way of way of having them watch a movie?

- Better because we don’t want a TV in the brain lab
- It’s different than watching TV
- Would be good because children get annoyed by the TV turning off
- Children of this time want to play a game - interact - rather an watching TV

Interpretation

The lab technician walked through her own workflow with the device. She said that it would be better for the measuring of the head to happen before the game begins. She also said that it would be nice if the game incorporated the measuring of the head and choosing the EEG cap into the game.

The game could include more of the different tasks that the child needs to do, like the eye closing exercise. Also it would be nice if music was a part of the design.

Playing Independently

Do you think children will be able to play the game by themselves or with the help of the parent? Or do you anticipate lab technicians will be needed to start playing the game? If so, which parts do you think will be difficult for children or parents to start playing by themselves?

- Children can do it by themselves
- I think it's better if they have to figure out the game for themselves
- It takes a long time to set up an EEG [would be good if they are distracted]

Interpretation

Having children take time to try to figure out the game from use cues will be good because it takes a while to set up the EEG. Children have personal motivation to play the game.

Curiosity

What conversations do you usually have with children about the EEG?
What parts of the game do you think would spark curiosity in the child?
Do you think the game relates the EEG well?
Do you think this game could help having conversations with children about the EEG?
What concerns do you have about the EEG game regarding the information that it is telling children?

- Children don't have a lot of questions about the EEG
- Children are conditioned to not ask questions especially in the hospital
- "I like the idea of more ownership and explanation, but there needs to be a moment"

Interpretation

Children are usually conditioned to not ask questions, especially at the hospital, but "I like the idea of more ownership and explanation, although there needs to be a moment." Possibly playing the game could be a moment, but this will have to be seen in testing.

Feeling of control

Do you think this game will help children feel more in control in the EEG space?

- Control would depend on the age
- The older children would realize it is just a game [and that they still have to do the EEG]
- More of a distraction for the younger children - that is the greatest benefit of the game
- Older children are quiet while watching the film
- A little child doesn't want to watch a movie for 30 min - they will move around alot (seen - younger children very restless)

Interpretation

Would depend on the age, more testing would be needed with children of different ages.

Safety

Do you think this will help children feel more safe or more nervous about the EEG test?

- Hard to say [will need to see their feelings in testing]

Interpretation

Will have to be seen in testing with children what they think of the visuals.

Affecting the EEG
Do you think that playing the game would overstimulate children and affect the EEG results?

- “A little maybe”
- It's best if everything is in reaching distance - not jumping up to the screen
- They should be sitting in place
- The size should be small (and reachable)
- When you see a child is getting too excited, it may be nice to have some way to calm them down

Diversity in the Children
Would the game be fun for children with learning disabilities?

- With less developed children - they could be stimulated by the lights and sounds while the parent plays the game

Interpretation

Children with learning disabilities could also be interested in the game with the lights and sounds, while the parents move the pieces.

Will the game be fun for children of various ages?
- Concerns about the age of the children
    - Older children may want ownership of the results
    - Very age dependent - may be good for children up to 8 but 10-12 maybe want more information on the brain
- “Little children just want to leave the room”
    - “Maybe some kind of reward”
    - Stickers as they are going through the game

Interpretation

There were concerns about what age the game would be appropriate for children - this could be checked in the testing with parents and children. The character may make a certain age group for children younger. There could possibly be a way to choose the age or level of the game to tailor it for younger vs older children.

Playing for the entirety of the EEG
Would children play for the whole time while getting the EEG?

Including Parents

Does this game invite parents and children to play together?

Improvements

Do you have any improvements, recommendations, or changes to the EEG game?

- For the eyes closed - a melody that would play for 10-15 seconds and that could repeat again to show children to close their eyes
    - Maybe there is something that the lab tech could put into the game to say how long their eyes should be open or closed
    - Should be very simple / easy to do

- Some children want to tell their friends at school (also the taking the pictures or selfies)
    - Maybe they want to take a picture while playing the game

- Regarding Sound
    - Sound is better for the little children
    - When they are little they like to listen to tiktok
    - Louder music can make them too aroused
    - Must be the right music for the age group
    - Unexpected sounds could be interested
    - Connected to the device "Where is the sound coming from?"
    - So they are looking and watching when something comes up

Interpretation

Sound is a very important aspect of the game and should be chosen wisely. It could make the game more novel and interesting, relating to the theme of curiosity discussed in the research. Sound could also aid in creating the different exercises for the children.

Children like taking pictures with the EEG, this could be incorporated more into the game or the ending of the game.

Personal

- There should more thought to the ending of the game - this is the beginning of the EEG for the child (this could be reflected in the guy)

Evaluation with Lab Technicians 2

Who: 2 Lab technicians

The Space

- It's better for the child to be laying down because they are more relaxed

Projection Game

- Concerns about the child moving while playing the game
- The video is good because children don’t move too much

- Game should be durable there was concerns about stuff breaking - especially for the less metnally developed ones

Things they talk about the EEG

- Mostly to do with the procedure
- It is difficult for parents to understand the EEG
- Usually say its a movie of the brain

Appendix L

Evaluation of Prototype with Students

Evaluation with Students

Goal

To test the functionality of the interactive game, if there are any problems with buttons or connections, and to see if it is understandable how to use it. The other goal was to see if it sparked curiosity for participants and whether they ask questions about the EEG.

Method

The interactive game, visualized in Figure FIXME, was given to participants, they were told that the game was representing an EEG and a part of the Child Brain Lab, but without verbal instructions of how to play. The participants played through the game as far as they could. Participants were told to feel free to ask if they wanted to.

Participants

Five students participated in the initial evaluation study.

Limitations

Because these are adult students, they have different capabilities than children. Because some of the students were design students as well, they have knowledge about how user tests are conducted.

Findings

From testing the game, it was found that participants would want to take off the electrodes after placing all 5 electrodes. This gave a feeling that the game was finished.

There was a lack of introduction to the game, more context of what is happening is needed.

Participants asked questions about what the electrodes were and what was happening - which sparked conversations about the EEG.

Changes

Based on the feedback, there were some changes made to the game before testing with children.

- A more thorough introduction was given to the game

- A start over button was added so that there would be less of a finish.

Appendix M

Evaluation with Child-Patients & Parents - Set up

Evaluation: Wavy

Goal

To evaluate the design of the EEG game, Wavy, on whether it creates a safe, explorative environment for children to learn more about the EEG on their own terms. To learn what children interpret from the game, whether the game sparks conversation about the EEG and if it causes anxiety or stress for children.

Main Research Questions

1. **What are children's interpretations** of what is happening while playing the EEG game?
2. Does the EEG game create an **explorative environment** for children ?
3. Does Wavy help create a **safe space** for children to ask **questions** about the EEG?

Sub Research Questions

Curiosity & Exploration

1. Are children interested in exploring / playing the EEG game?
   Ask how they like the game and see how long they play it

    a. How long does it keep their attention?
       Time how long they play the game

2. Does the EEG game spark curiosity for the children about the EEG?
   See if the children ask questions about the EEG while playing the game

Understanding / Conversations

3. Do they understand that the game is related to the EEG?
4. What do they understand about the EEG game?
5. Does the game open up areas for conversation for the child?
6. Do the children ask questions about their EEG experience while playing or after the game?
   See what they talk about while playing the game
   Ask what the children understand about the game afterwards

Independent Playing

7. Are children able to play the game independently or with the help from a parent?
   Watch children play the game and see if they need parents help to play

Including Parents

8. Does the game invite parents & children to play together?
   See if parents also play the game with their child

9. Does it invite conversations about the EEG with the parents?
   What questions do children ask about the EEG
   Hypothesis: That children will ask questions about the different waves, especially the beta and gamma as those are the ones that seem like they have a 'mistake'

Integrating into EEG appointment

10. Will children like playing the game while an EEG cap is being placed on their head?
11. Do children mind stopping and starting the EEG game?
12. Do children like or dislike that the game / character is telling them to do certain activities (measuring/placing EEG cap)?

Overstimulation

13. Is the game overstimulating to children? (are they jumping or moving around a lot?)

Anxiety

14. Does it help children be less anxious about the EEG?
    a. Do they find the game friendly?
    b. Does the information in the game make them nervous or confused?
15. Does this game will help children feel more in control in the EEG space?

Age Appropriateness

16. Is the game appropriate for children from ages 6-12?

Method

The parents and child-patient are shown a video introducing the new space and game. Then the child-patient plays the interactive game with their parents. Afterwards an open discussion interview

1. Thank participants for participating and have them read & sign the consent form
2. Introduce the imaginary setting and give context of where/when the game will be played
3. Then have patients & parents play the interactive prototype of the game
4. Ask questions and reactions of the game
5. Then show the full design - the imagined space, the video of the waves, and how the game works with the projectors/physical pieces
6. If in the hospital, show the prototypes of the physical pieces and ask them to pretend to play with them
7. The parent (with some questions to ask to the child) will be asked some interview questions and have an open discussion about the game.

Limitations

To reduce biases for the participants of the testing, information about the research study and conclusions was not included and the information was of only the resulting design. But because three participants were follow ups with participants who had already previously participated in the research portion, some sort of biases could not be avoided.

Some of the testing was done online instead of in person because of COVID-19.

The testing was done to see what children interpret from the game, but not during an EEG test. If this test shows that Wavy does not cause more anxiety for children, future testing should be done during an EEG test.

Ethical

One of the main findings from a previous co-creation session with children about the brain showed that children fill in gaps of knowledge with their own imagination and this can lead to greater anxiety for children (Gielen, 2019). Therefore, it was important to first test what children's interpretations of the game was at first before doing a more thorough test during the EEG.

Consent forms were given to parents and patients to understand the purposes of the study. Parents were present for the testing and showing of the video.

Introduction Script

Hi, thank you for helping evaluate the design of the EEG experience. I'm first going to let you test out the game and then after give an overall look at the space.

For the game usage process, imagine that you are at the Sophia Children's Hospital new Child Brain Lab. The lab technician asks a few questions about general brain health and then you arrive at the EEG station. The lab technician turns on this video and game to be played during the brain test. Let your child play through as much as they can, but you are also welcome to help or play if you want to or if your child is having difficulty playing as well. If you want to ask questions or stop anytime feel free to do so.

Interview Questions with Parents

Initial Reactions
Look for initial reactions and emotions of the parent and child while they watch the video and play the game.

What did you/your child think of the game? Did they like playing the game?
Would they like to play it during the EEG procedure?

Questions for the Child
What do you think of the game?
Would you play the game again? (why or why not?)
Would you like to play the game while getting an EEG test?

The Space

What do you think of having a shared space with the lab technician to play the EEG game?

Integrating into EEG appointment

What benefits or difficulties do you see in having children play this game vs the traditional way of way of having them watch a movie?

Do you like having the EEG game integrated into the appointment (e.g. having the character tell when to close and open their eyes)

Do you think your child would like playing this game while having an EEG cap placed on their head?

Independent Playing
Look for if children are motivated or able to take control of the game for themselves, or if they need parent's help.

Was your child able to play the game by themselves? Did they need your help?
Were their certain parts that were difficult to understand?
Which parts do you think will be difficult for children to start playing by themselves?

Playing for the entirety of the EEG
Look for how long the child played the EEG game before getting bored or tired
Do you think your child would like to play the game again? (ask the child-patient)
Would your child play for the whole time while getting the EEG?

Understanding

What conversations do you usually have with your child about the EEG? (if new participant)
Do you think your child understood that this was a part of the EEG (or ask them to ask their child what game were they playing)?
Did you child ask questions about the EEG?
Did they ask questions about their previous EEG test?

Anxiety

Do you think this will help children feel more comfortable or nervous about the EEG test?
Did the game tell them something about the EEG that would make them nervous?
What did your child think of the visuals (the guy, the brain waves)?

Overstimulation
Do you think that playing the game was overstimulating for your child, if they would also have to be paying attention to the lab technician sometimes as well?

Age Appropriateness

Was the game appropriate for your child's age?
What made it too young/old for your child?
What would make it better?

Including Parents
Does this game invite parents and children to play together?

Improvements
Do you have any improvements, recommendations, or changes to the EEG game?

Appendix M

Evaluation with Child-Patients & Parents - Notes & Results

Evaluation -1

Interview - July 10, 2020
Participant: Father of child-patient

Introduction of game, game plays

"So what am I supposed to be doing at the moment?"

- Maybe not instruction for what the game is
- Then researcher explains more of what is happening, that it is changing the brain state and what the electrode are

"So everytime I activitate one of those spots, then you see that it is connected with in the network"

- Then explaining that multiple electrodes are needed to create brain network
- Explaining that brainwaves are happening at the same time
- Explaining the different kinds of brain waves
- Explaining the different brain states

Could his child play the game?
"Looks very nice, but I don't understand what is happening"

"I push this start again button, I see that I'm sleeping, and that a bit of electricity is between one or the other"

"Then what happens when I press 4+3 [one of the brain states]. Can you tell me what is happening here?"

- Explaining the beta waves and that you need to sleep or eyes are closed
- Explaining gamma waves

"So actually what you are doing is on the left is several states of being and then on the right you can see what the states of being do to the types of electrical waves on your head. By pushing those five buttons you add electrodes and then you see that you can measure more of the head."

"I think it's a very funny thing, but isn't it more stimulation than a game."

"It took a bit, because you called it a game, so I thought it was a goal so I thought **'What buttons do I need to push to be successful.**' When someone calls it a **game**."

"Because at least for me, I was thinking, 'Am I doing this wrong? What is my assignment, what do I need to achieve.' But it's more like exploring, what the doctor is doing at the moment."

"So I think it is a very fun thing. That can be very nice for a kid to explore as well. But for some reason I was making associations with the word 'Game'."

Parent played the game for 9 minutes (before researcher shared her screen)

Researcher explains entire experience, space, physical pieces

Regarding the space

“So its a more straight up chair”

They do it a bit differently because they have caps and eye tracking

“I think its nice to have one big table, one big space. And the lab technician can roll around on her small technician”

“The projector is on the ceiling and projector onto the table?”

- Should explain set up a bit better
-

“Its funny cause I think its a very nice a idea. For me I think its very nice because it is a way to some how simulate what the doctor is doing. So if I have to sit very still, then I can turn the control in the experience/game, so this funny figure [the guy] is still, so then it relaxes the activity on the brain. Then when technician says stare into the light or blow into the windmill, then the child will realize that we are changing the settings and turn the control and change the settings in the brain.”

Minding that placing the cap while playing the game?

“I think so, from what I remember the EEG took 30 min. [Child] was watching this minion movie and at some points was time for watching movie or doing something else. Then another assignment and the movie is paused for a while.”

“I don’t know if you have the opportunity to play the game in the real setting. I can imagine if I was to ask [my son] to play this game on the computer screen at home. It would be very hard to imagine how to play with this EEG station. **The child can experience the game very differently during the EEG, in the room, when the EEG is going on**. I think when a kid is watching a computer screen at home, it gives a much different experience”

“I’m just trying to imagine how this game works in a lab and undergoing an EEG and I can imagine a child gets a lot more out of it when the technician, while doing his or her work, guides the kid a bit through the simulation game. I can imagine that if the kid is just given the game and **just to figure it out by him/herself** what it represents **might be very for challenging**, at leasft for me, then for me then for kid as well.”

“But I think it can be of course very nice, cause at least I experienced when we were there, that the technician tries ocmfor the kid and to ask questions like ‘what are you hobbies’ and ‘what do you like’. And I think this game can be a very interesting tool for the lab technician as well to just have something to talk about with the kid and use it to explain what is going on. And to explain that when you sleep your brain works differently than when you are awake and why you have to do these various exercises that affect your different brain activity levels. In that way I can imagine that it is a very nice too for the lab technician to interact with the kid as well.”

“If theres a goal then it to give the child some sort of understanding of what is happening with this EEG”

“When you think about that but maybe for children it will be easier to understand that these signals if there are much more different from each other”

- (Forgot to show the rest of the visuals) - then show the visual of the game

“I think that would make it more differentiation between the different states of your brain [the different waves] more clear and more understandable and to connect the game to what is happening. And why you have to do nothing or sleep or blow [hyperventalate]”

“I think its nice, you have been spending a lot of time thinking about this thing.”

“I think one thing as well, the design of the room, and that it is very nice that the parent and the child are sitting in the room, at one table, **so they are going through this EEG together.** Maybe the father or mother should put on an EEG cap as well, even though they aren’t not doing the EEG but just to put on the cap (but something that is clean, because I don’t want a cap that has lice or something). But then it is more of an experience together.”

“But I like the design of the room and the interactive visual is very nice and that is physical and digital it is very nice.”

“I wonder if, kids are interested in the game is interested for 20-30 minutes so maybe the movie screen is still a good idea as well. Maybe its nice or to use the projector for something else as well. I think that the child would be interested for 10-15 minutes. Especially if the child has had 4 EEGs before, maybe they aren’t interested as much as the first time. Then this projector gives the opportunity to project other things as well. The TV / iPad children have but a projector that is on the table is different than before. For multi purposes.”

Do you think [child] could play the game by himself or would he want to play with you

“**I think he would be interested in playing with the technician**. A communication tool between him and the technician. Of course I can join in a bit, but I think he would be interested in learning about what is going on during the EEG.”

Age appropriate for child? (he is 8) Should there be more text information?

“[Child] started reading so he can read short sentences quite well (4-5, 10 words). If there was some simple text or explanation might make a more interesting. He is certainly not too young to play the game, he would play for 5-10 minutes. His brother is like 10 and would get bored faster and sooner. But he is older as well and you can tell him more easily to sit still for 30 minutes. So maybe it doesn’t bother an older kid.”

Any improvements/recommendations?

“I think its a big improvement already if you are able to realize this idea and design it for the room. **Its much nicer place than it is now**.”

“Will the design be realized? Is there budget?”

- TBA - hospital design

“**I wonder what the lab technician if they consider it useful, then if they think it is useful then it is an extra stimulant [incentive] to create the game**.”

Explaining further testing plans in phases - I don’t want to negative experience for the hospital

“I don't see any reason for children to see this as a negative experience.”

Evaluation 2

Background
10 year old girl
Has epilepsy at night
Was getting electrodes/net placed for an overnight EEG
Mostly calm/accepting during the placing of the electrodes

Reactions to the Game Prototype

Did she like the guy? - Seemed a bit confused by the guy

Thoughts on the game
Is the game fun? “Nei”

“Boring!”
“She finds it a bit boring”

Would she want to play again?

“Niet”

Why was the game boring?

“Because it was a bit repetitive”
“Too slow”

What would you change?

“Alles”

What would make it better?

“If there were questions and she had to answer questions”
“And learn about what she is seeing”
“And learn more things”

- Having more information / more information to read

Interpretation: 10 year olds want more independent playing and more information. Game was boring and repetitive for her - maybe not age appropriate.

“Thought the game would be something she would have to play”

- “She thought there would be a **real game** that she would play”

- “More information

Interpretation: The term ‘game’ implies a competitive thing that she has to play and raises expectations of the prototype.

What she said during the game

- Asked questions about the different stages of ‘the little guys’ activity
- Saying what the different brain activities are and the colors relating to them

Interpretation: There was information that was interesting and that started a conversation between her and her mom.

“What does she have to do?” - Parent while child is in the middle of the game

Interpretation: Game needs more context or explanation

- She thought that the game would be more of the game
- Started naming the colors in relation to the brain waves / brain states

Played for 8 minutes

- Even while saying it was boring, she still was clicking buttons and playing the game

Interpretation: Even though she says that the game is not interesting, she continues to play the game.

Showed the real imagery of the game

- But still seemed not interested

Showed the physical pieces

- She was very interested in the physical pieces
- Started stacking the pieces
- Spinning the different pieces
- Throwing them around
- Placed all the electrodes around the different places
- Wanted to make the pieces into a computer mouse

Interpretation
The physical aspect of the game is very important and makes the interaction much more fun. Making sure the pieces are durable is also important as children are throwing things around

Shared space

- “Looks very nice” -Parent

Other comments on her mood

She is uncomfortable from the net
She was also a bit tired and hungry after the appointment

She thinks the game is boring and would rather watch a video during the EEG

What do you talk to her about the EEG?

- If you have epilepsy at night then the EEG can pick up the signal
- “I told her at night she is making noises and this would be able to detect them”

To do interviews better:

Don’t stop yourself too soon
Ask more why questions
Which parts did she like or didn’t like? Did she like the beginning of the video?
Did she understand what was going on with the guy?
Maybe giving more context in the beginning?

Evaluation 3
July 15, 2020

Boy: 5 years old
Had a lot of surgeries when he was young

Logistical things

- The beginning was missed the first time because it plays before they were ready
- And then the screen appeared the question
- After the explanation things were more clear
- Then I showed the beginning of the game again

- But child seemed to like the little guy
- Child had a difficult time playing the game by himself because he wasn't good at using a computer touchpad
- Sometimes you want to watch the beginning again

Understanding the Game

- Confusion about what was happening - not enough information about the head measuring and picking your cap
- Confusion about when the game started and when it was his turn to play
    - In the beginning he said "I don't know what to do"
- Lack of introduction was very confusing
- After explaining what the electrodes / other information is - they were interested and were able to explain it to [child] and he looked very interested and happy
- For him explain a little what is going
- Have to explain that what the knob is and how it relates to the brain

- He then wanted to show his toys - lego brochure

The Little Guy

- Child really liked him - smiled a lot and laughed
- Child said it was "leuk" (nice)

Anxiety

- Child really liked the little guy - he smiled when he was moving and laughed

Understanding

- Parents explain what is happening a

- His dad also rubbed his hand around child's head to mimic the measuring tape as it was happening
- Mimicked measuring the head by wrapping the earphone around his dad's head ("measuring" his head)
-

- The bouncing lines made him very excited and happy
- He really liked the game
- It wasn't clear what to do with the buttons
- But there wasn't a sound or something popping up
- He is 5 years old so when he clicks on something he expects a sound or something to happen. So it made it difficult for him to understand what to do

How to Play

- Difficult for him to know how to play without his parents
- Parents also asked questions about pressing the buttons
    - "You just have to press on the buttons?"
    - Confusion about which buttons to press
- After watching the introduction and playing the game there is an information game, then you see the button and click on it but there's no explanation so it was hard to understand

Inviting to play with is parents

- Parents very included - they all played together
- Talked about the different parts of the game
- Child would pick which button to press
    - "Nie diz it" (No pick this one?)
    - Laughing a lot

Sound

- "We don't hear any sound, is that ok?" - expected to hear sound
- Child was also expecting sound, especially when things were popping up

Relating to the EEG

- When they watched it a second time they said do you remember when they were measuring your head at the hospital
- "Quite understandable
- "Remember when they are measuring your head" "Yes yes yes"
- "For him very clear because he already had the experience"

- By clicking on the electrodes it should be clear that is is the electrodes you are placing on your head rather than the buttons
- Because the electrodes have this cord on them as well
- “It could have been more clear for [child] if there was a wire that goes on the head and that when you click on the button there is a little sound and if there is wire then it would be more clear what he is doing and making the link because what he saw first and what he is doing now in the game”

Does he like the game?

- “Yes, but we need the introduction if it was clear from the beginning what was going on”
- “Wit the right information he would like it”
- When child clicks on something and sees something new then they always like it but sound would have also been helpful

More information on the game

- “We were looking for ourselves what to do but if we were to know it ahead of time then we could explain it to [child]”
- “He’s only 5, with a 8-9 year old they could do differently”
- “Could play it faster” [if older]

Doesn’t play often on the mac so his clicking skills aren’t as good

Regarding the space

- “Yes very nice, good idea” “We would like to see this kind of innovations in the hospital, would be very good for children”
- “I think it would be very useful, ok for the child” - regarding the seating shared seating

Needs more introduction - who does it? Or does the game do it?

- “It is very important for the child to know what to do, because the circumstances are very threatening for the child” “If it explained by parent or lab technician then it takes away his anxiety/nervousness” “You can take away anxiety if you explain everything very well” “I think it is a great idea”

Was he nervous or anxious about anything in the game?

- “No nononono”
- “The circumstances at the hospital, you [the child] don’t know what is really going to happen, you can explain over and over again and they will surprised”
- “When we explained it real life and real time there would be no problem for him to understand what would happen next”

Playing the interactive game during the EEG

- “When we would know/be prepared about what is going to happen then he would be able to sit still and concentrate on the game”
- “You could choose to place the electrodes while the lab technician is doing it or right after”
- “Or you could place the electrode in the game as each electrode being iplaced on his head”
- “Then he understands what is going on”
- “When the child is playing the game, then you should place the electrodes on his head so that he can see all the actions that being done while he plays the game are being replicated in real life but understand”
- “We think it is a good option, but you would have to see in real life how they react”

Age appropriate

- “Well a bit difficult without the explanations”
- “The little knobs and buttons there
- “There is too little information in the game about”
- “Now its a bit of serious game”
- “When you click on the first electrode - you could said ‘en electrode is on’” the first hting of the EEG is done and then we can move on to the next step
- “[child] was really waiting for something to happen” [after placing the first electrode

Anticipation! But not really rewarded

- “A child of his age wants something to happen”

Overstimulating

- “No not over stimulating - quite right when there would be little surprise in it”
- “Only 5 or 6 buttons which is good”

Ask questions about the EEG

- “Yes yes for sure”
- “We showed [child] a movie about the EEG and he could ask his question before going to Rotterdam, I think but when he plays the game he will ask questions as they pop-up in his head” “He wouldn’t wait 5 days, he wants to know the answers right away”
- “It would really stimulate him to ask questions of all types”
- “So really simple questions but also philosophical questions”
- “He could ask ‘Why are we doing this’, but he could also ask ‘Why is this for me?’ so it depends a little bit”
- “He will ask us questions, no doubt about it”

- “So when theres an explanation it, its very interesting. It because a lot of information is very interesting”
- Lab techn vs parent vs text explaining
    - It can create a conversation with the lab techncian
    - If parents read then its the best link because the child has a link with their parent

- Or parents can read or child can read when they are old enough

Evaluation - 4
24.07.20

8 year old boy
Some learning difficulties
Has seizures where he is gone for a few moments and doesn't realize

Curiosity & Exploration

- He liked playing the game
- He would play the game again, during the EEG
- He thought that the game was funny
- He asked questions about what was happening with the game
- He was trying to understand what was going on
- Having a lab technician
- Played for 12 minutes

Understanding / Conversations

- He could understand that the game is related to his EEG experience
- He asked questions about what was happening during the game
    - Asked about the different emotions of the characters "Wat is dis?" Dromer (sleeping)
    - Was a bit confused about whether they were sleeping/awake/eyes closed/open
- The concepts were difficult for him to understand
    - That Different activities are linked to the different brain waves
- Father seemed dubious that children would be able to make the link
- But child understood that the waves that he was seeing was the same as the ones doctor sees on the screens
- "It does make it easier to understand" but some concepts were hard to understand
- Because the EEG is hard to explain
- Having a lab technician, someone who knows what is going on, would be nice to conversations with

Independent Playing

- Child was able to play the game by himself
- He was in control of the game
- Self motivated to click the buttons, but needed indication to click the knob

Including Parents

- Parent was explaining the game for child
- And he was asking questions with parent

Shared Space

- Shared space is easier
- Not having to move between too many rooms would help save time
- Visible and understandable

Integrating into EEG appointment

1. Will children like playing the game while an EEG cap is being placed on their head?
2. Do children mind stopping and starting the EEG game?
3. Do children like or dislike that the game / character is telling them to do certain activities (measuring/placing EEG cap)?

Overstimulation

- Not overstimulating
- “I think it will be a calming game”
- “It will calm them instead of making them nervous”

Safe space

- He would feel more comfortable playing the game because it would be a distraction
- That is what the nurses tries to do with the children - calm them down
- This game would help do that
- The little guy also helps

Anxiety

- He liked the guy from the game
- He was not nervous
- It would help feel like time is go faster

Age Appropriateness

- Was appropriate for child
- He liked the character
- But wouldn’t work for older (e.g. sister who is 13)
- Really needs to focus the gap because it wouldn’t work for 6-12

Appendix N

Consent Forms [redacted]