

ARAMA

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Industrial Design Engineering

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1 User Insights

2 Concept Development - 2D

3 Concept Development - 3D

4 Final Concept



USER RESEARCH

The Brief

Design and engineer a battery-powered, hand-held device for home, garden or educational use that not only appeals to mass market, but also meets the needs of a specific, underserved user group.

Product Opportunity

I have decided to focus on the topic of communication - helping the children to communicate and helping others to communicate with them.

Our Experts



Dr Geetha Kugan
paediatrician for people with
special needs



Dr Ailsa Russell
autism researcher at Bath
University



Ms Sammy Fielding
nanny for three severely
autistic children

User Interviews

Children **cannot communicate** when they are feeling overwhelmed

By the time that adults around them have realised, it is usually **too late** and the children have meltdowns

Children **cannot communicate** when they are in the midst of a meltdown, so it is difficult to know what upset them

Children cannot recognise their own **emotional triggers** and therefore cannot communicate them

The children do not like being the **centre of attention**, especially in crowded situations such as in school

Autistic children struggle with things that are **intangible**, making communication very difficult

Non-verbal autistic children cannot communicate when they **want or need** something

Severely autistic children struggle with responding to **open-ended questions or statements** but can respond when they are given options to choose from

The children can respond much better to instructions when they are **written**

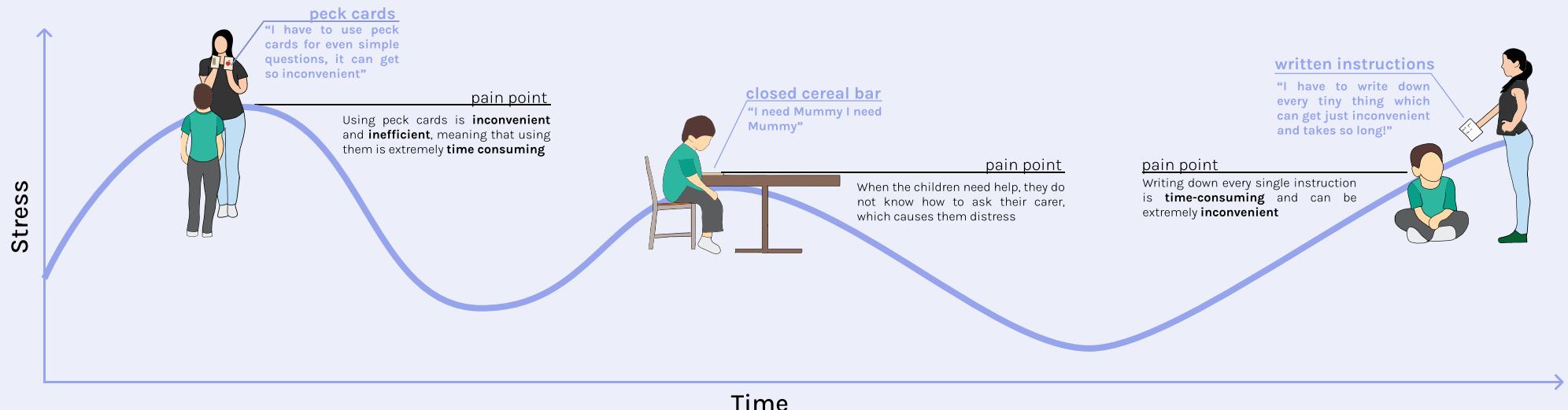


OPPORTUNITIES

After speaking to different experts, I have decided to focus on communication in the context of making day-to-day life easier. Further journey mapping will help me to identify precise design opportunities

Journey Map

a journey map showing the difficulties faced by Ben, a child with severe autism, and his mother, Rachel, in trying to get ready for school in the morning



Opportunities

- How might we **communicate instructions** efficiently to them?
- How might we get **answers to questions** that they find difficult?
- How might we allow them to **ask for help** for simple tasks?
- How might we help them detect when they are **anxious**?
- How might we help the children **calm down**?

The above opportunities have been developed as a result of both user interviews and inspection of the journey map and will be used as a basis in ideation

User Requirements

- Lightbulb icon:** The device should be discrete - autistic children do not like being at the centre of attention, so the device should not draw any attention to them.
- Lightbulb icon:** The device should be clear and display only the essential information required - autistic children often struggle with an overload of information.
- Lightbulb icon:** The device should not cause any distress to the user - for example, should not trigger them if they are sensitive to certain lights, etc.

CONCEPT

1

Opportunity: how might we allow carers to communicate instructions efficiently?

This concept focusses on helping children understand spoken instructions given by carers, by converting them into a written form.

2

Opportunity: how might we help children detect when they are feeling overwhelmed or anxious?

I have now incorporated another opportunity into the concept: it includes a wristband which will track the user's pulse. When it accelerates too quickly, it will show that the child is getting close to meltdown.

3

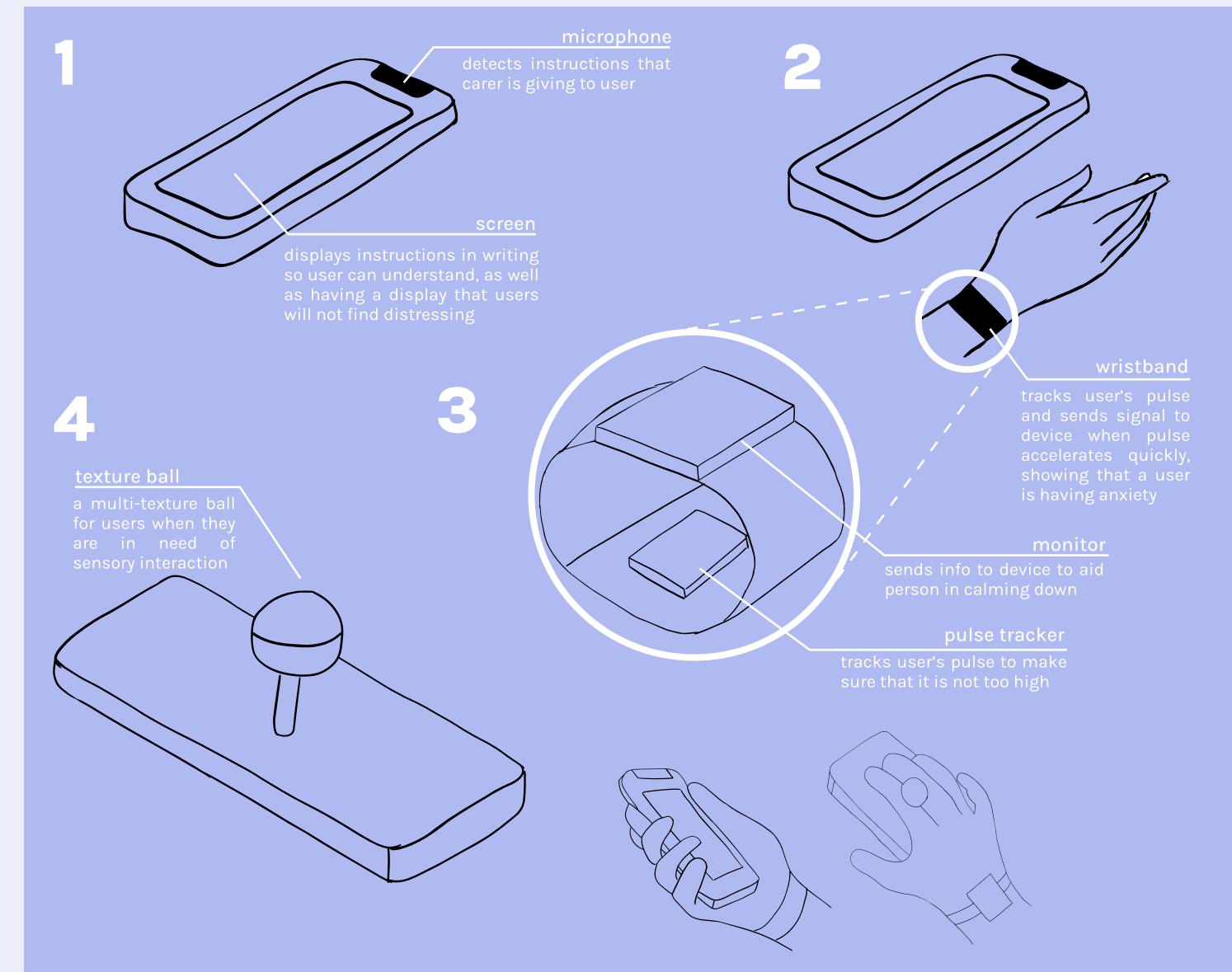
The pulse tracker will keep track of the user's pulse while the monitor will transmit that information to the device.

4

Opportunity: how might we help children calm down?

From Dr Kugan, I learnt that many children find sensory interaction calming. A multi-texture ball on the back which the child can touch can help them calm down.

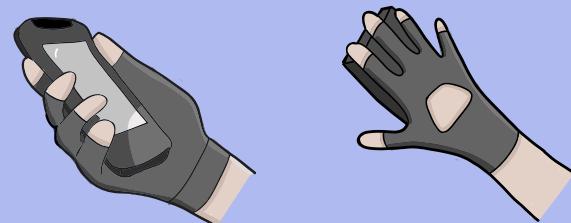
User research led to the formation of multiple how might we questions. While I start by designing for the question "how might we communicate instructions effectively", I will develop this concept until it is able to address all of the design opportunities.



FORM

The concept currently incorporates the opportunities of helping carer's communicate instructions, as well as helping to detect a child's emotional state and calm them if required. I am now going to continue developing just these features further, in particular thinking about their form.

1

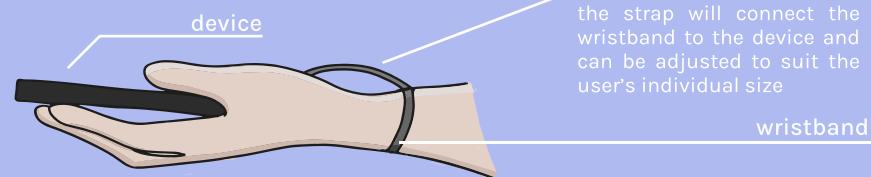


"Gloves are very tricky for the children to put on"

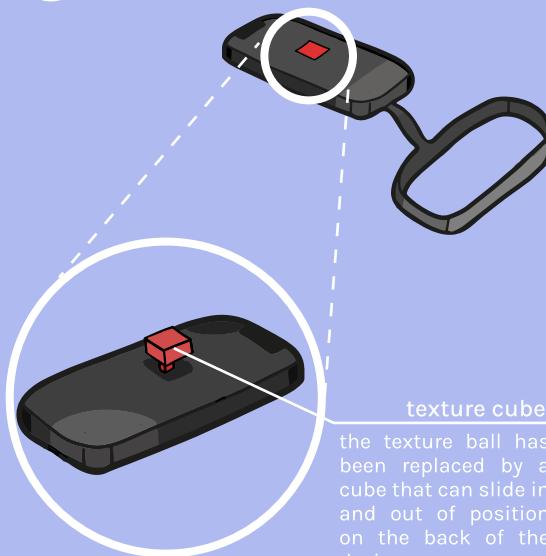


Sammy Fielding

2



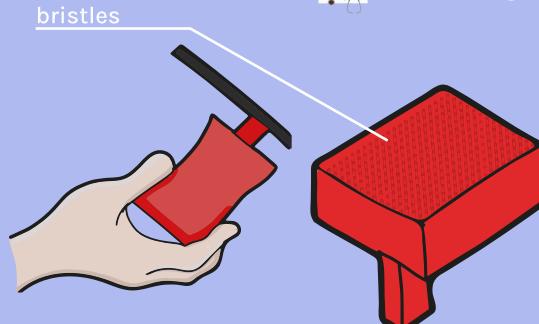
3



"Brushing and squeezing help the kids the most"



Geetha Kugan



There are opportunities for the texture cube to be squeezed and brushed if the user needs

1

I thought of incorporating the device and wristband together into a form of glove, with the device attached to one side of it. However, after speaking with Sammy, I found that children often find putting gloves on tricky, so I will find another way of incorporating them together.

2

Replacing the glove with an attached wristband will make it easier for the child to put on and will be easier for the user to interact with it.

3

I had planned on having a texture ball on the back of the device. However, I am going to replace it with a cube. This will allow it to easily slide in and out of position on the back of the device, so it can be incorporated more subtly. Dr Russell said that children hate being at the centre of attention, so it is vital that the product should be sufficiently subtle that it will not draw attention to itself.

4

Interviewing Dr Kugan showed that children often require sensory interaction to calm them down, and brushing and squeezing sensations helped them the most. Incorporating these two textures into the texture cube will best ensure that it is helping children to calm down when they require.

FEATURES



The device converts verbal instructions into written ones, as well as providing a visual cue for the child. An E-Ink display with a simple UI will ensure that the child is not overwhelmed and having a cream background with writing in Helvetica (the most calming for most autistic children [1]).

The device currently answers the opportunity "how might we allow carers to communicate instructions effectively". By modifying the features of it, I would like to incorporate more opportunities into the device in order to make it more efficient

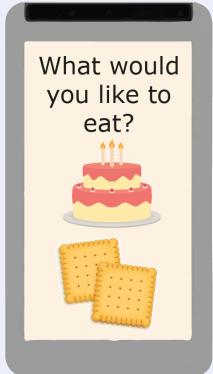
The kids respond better to questions when you give them visual options



Sammy Fielding

Opportunity: how might we get answers to questions that the children usually struggle with?

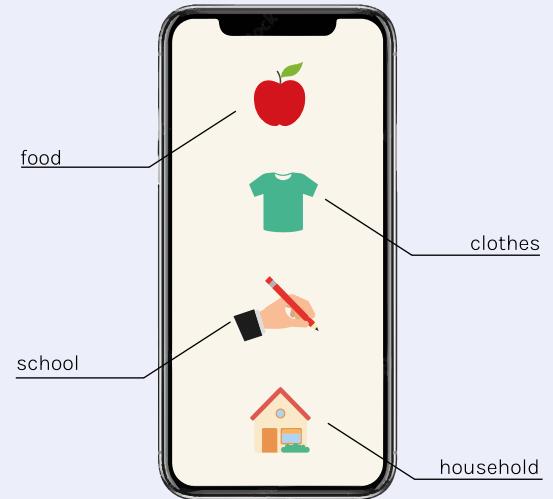
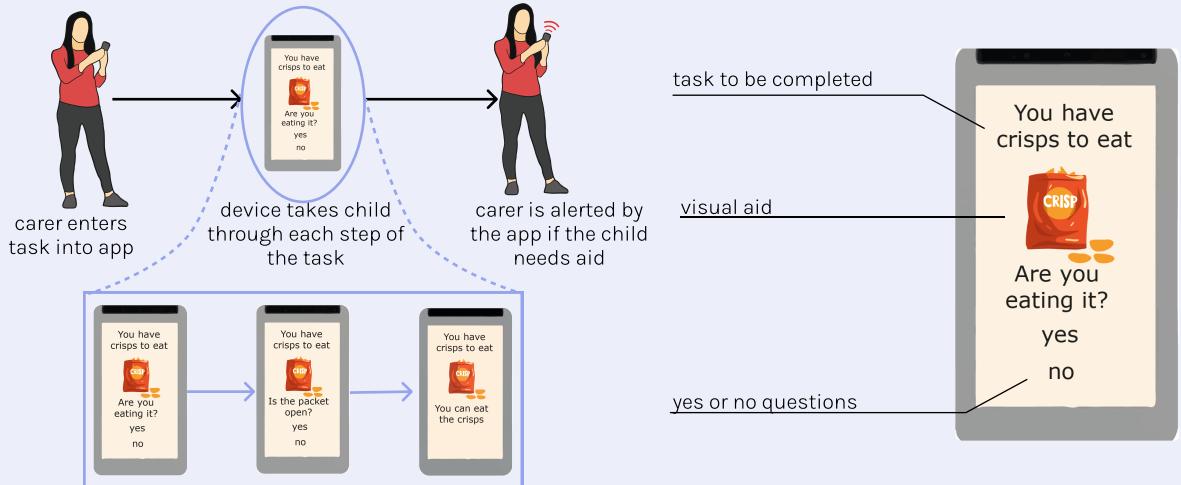
The device can also be used for the children to answer questions. When the carer asks a question, it will appear on the screen, accompanied by visual cues, and the child can tap on their answer to communicate it to the carer.



The children struggle with easy tasks because they do not realise how to ask for help



Opportunity: how might we help children ask for help with simple tasks?



Originally, I designed the device to help with eating. However, this can be expanded into different categories, helping the child with getting dressed or undressed, as well as with school work, such as homework, and small household tasks such as brushing teeth. These are all basic parts of life, and by helping the carer to communicate them to the child, it will make the lives of both the child and the carer considerably easier.

FORM PROTOTYPING



I experimented with different forms for the device to take, in order for the child to be most comfortable holding it. I then sent them to our experts, to find out which one the children would like more.

After speaking to the experts, I developed a third idea, where the user could comfortably grip the device by using the finger spaces at the side. This is the idea I will go forward with.



For these prototypes, I did not include the finger spacing, although they will be included in the final design.

I prototyped the idea of the wristband being attached to the device. While it would work, it would be best if the connection was elastic, so that the device could be held inside the band if it was not being used.

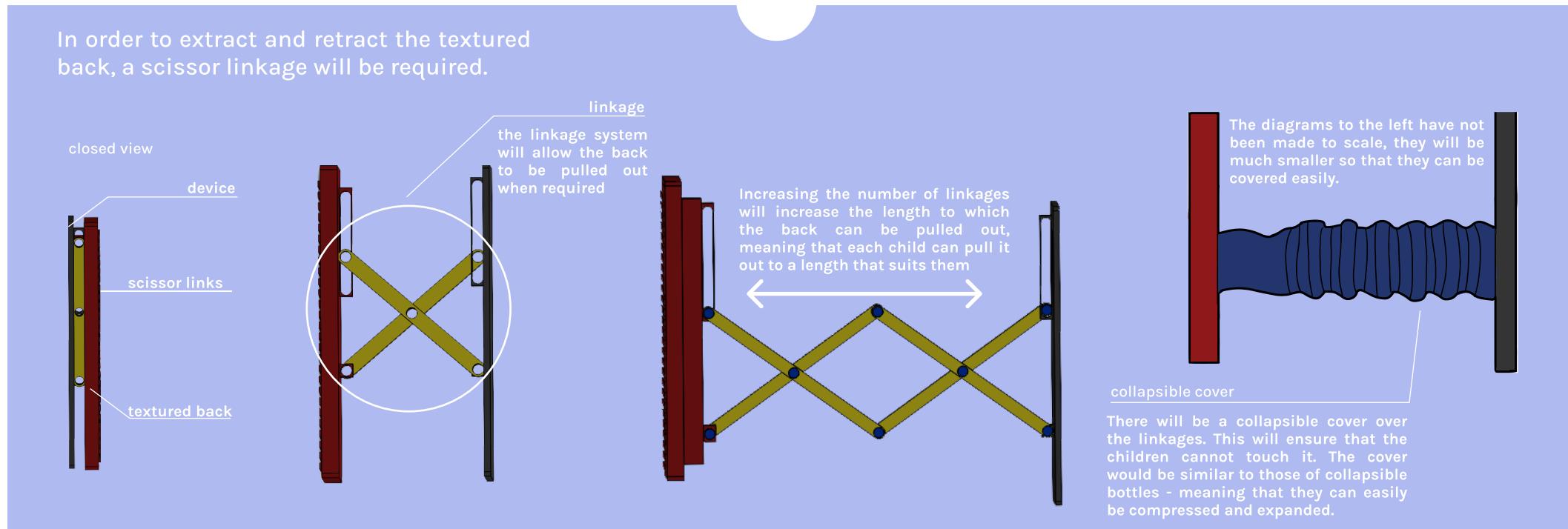


Carers are usually looking out for when the child is getting anxious

 Sammy Fielding

After showing the prototypes to Sammy, she told me that since carers are always very aware if the child is becoming anxious, so the idea of a wristband which can track the child's emotional state and alerts the user is unnecessary, as the carer will be able to tell without the band. Therefore, I will discard this part of the design, and just focus on the interactive and sensory parts.

MECHANICAL PROTOTYPING



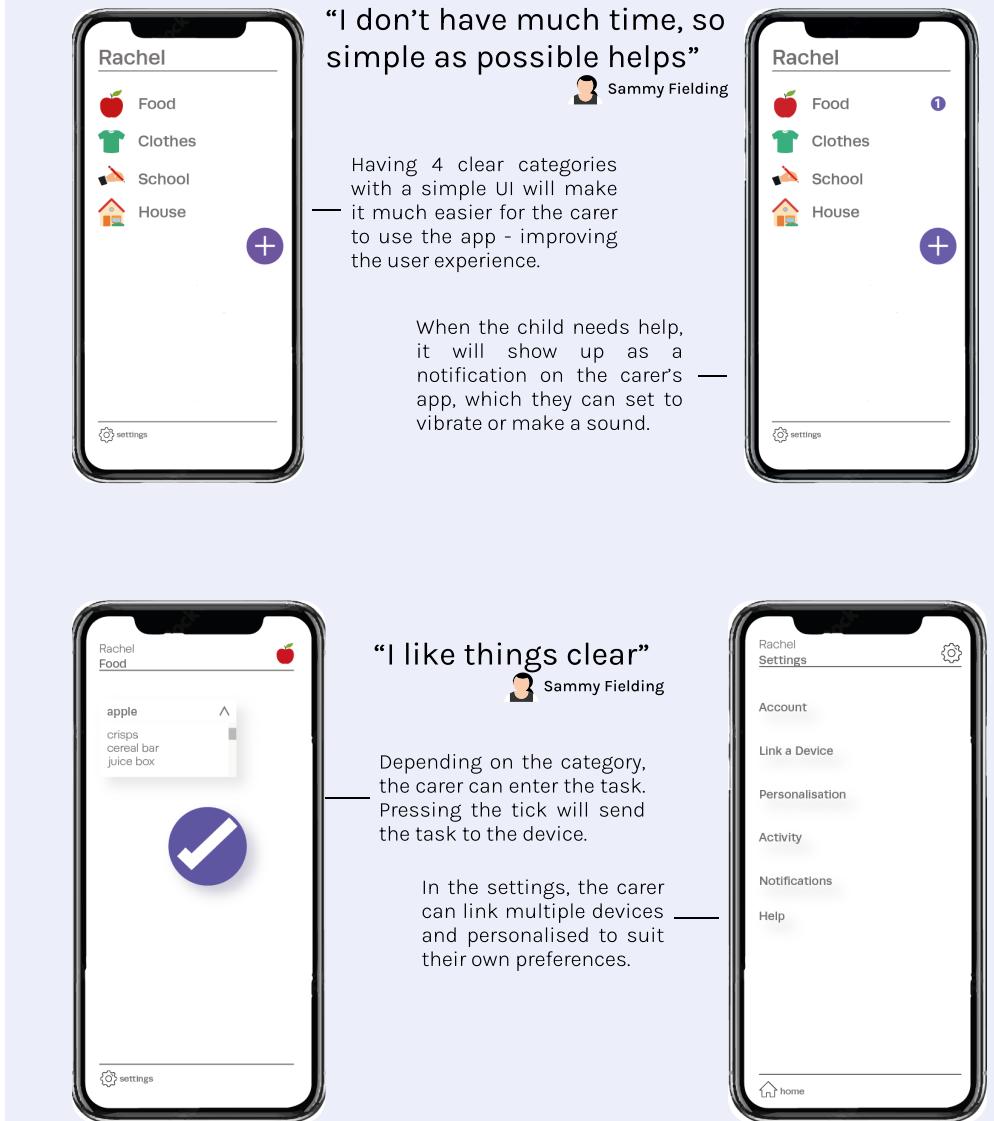
SOFTWARE & UI PROTOTYPING

Voice to Text



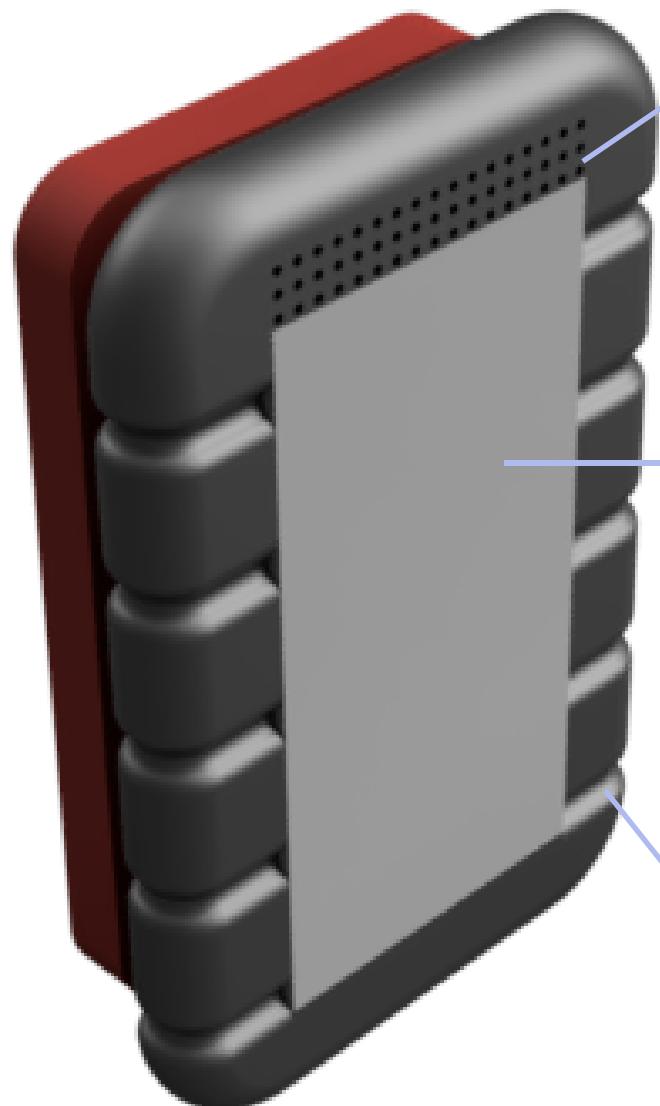
link to code: <https://github.com/anushanarayan2911/software-prototyping-voice-to-text>

App



link to code: <https://github.com/anushanarayan2911/software-prototyping-app>

ARAMA



microphone

the microphone will receive instructions or questions when the parent gives them, and send them to be displayed on the screen

E-INK display

the E-INK display will have a muted background, such as cream, and display the instructions and questions in Helvetica font, with an accompanying visual

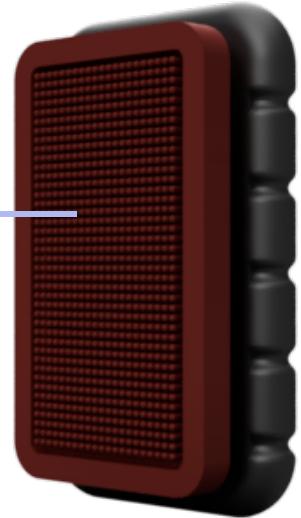
finger gaps

the gaps at the side of the device will allow the child to easily grip the device



bristles

the child can brush the back to help them calm themselves down, as well as squeezing the sides if required



extension

the back can be pulled out to a length that will suit the child

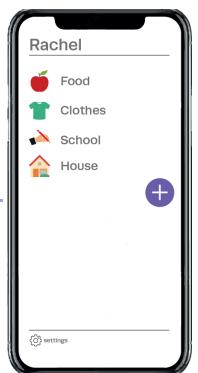


instructions

instructions given by the carer will appear on the top, with a visual underneath to help the child

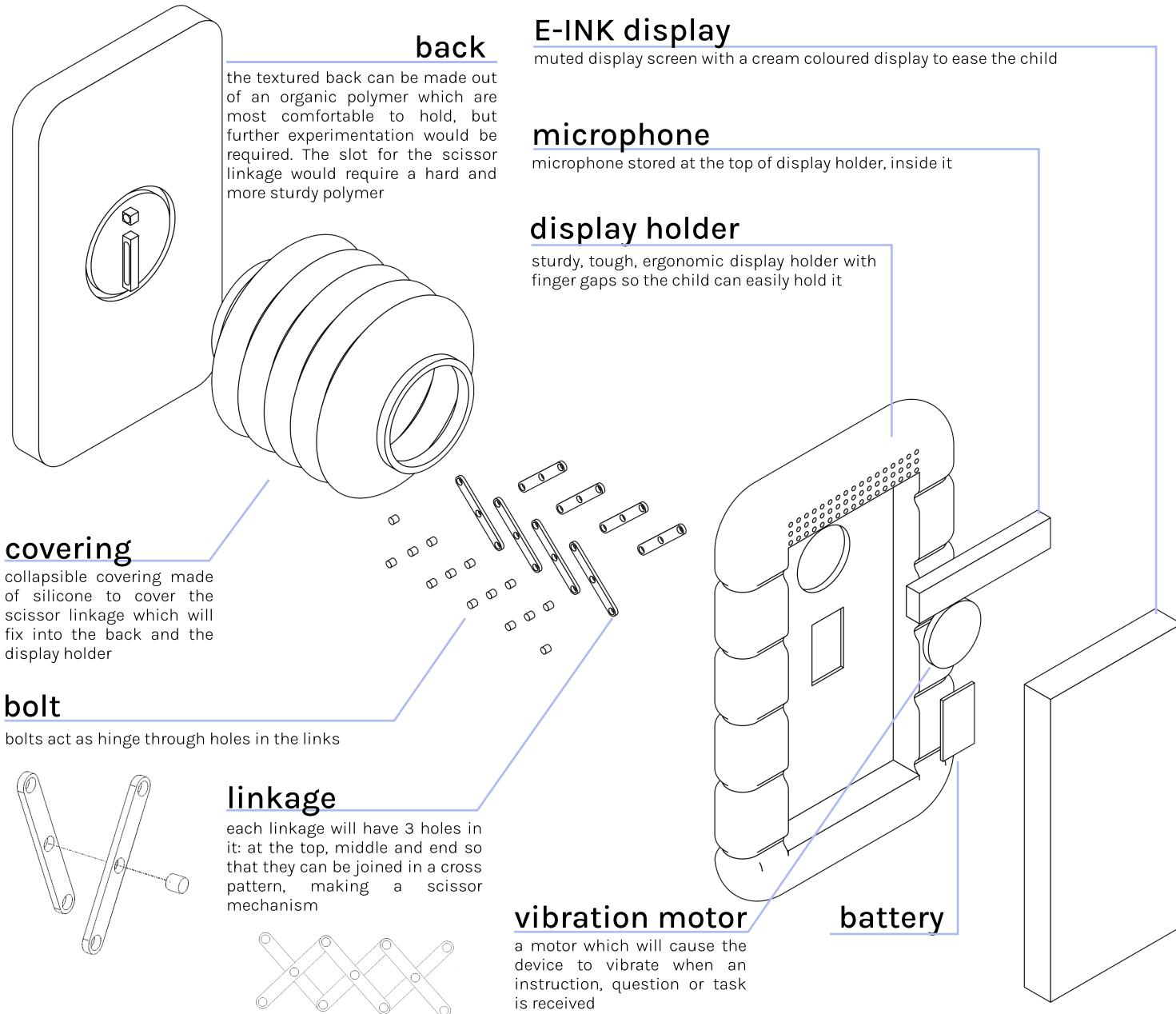
questions

questions asked by the carer will appear at the top, with pictures to symbolise the different options for the child to tap on



There is an accompanying app which will connect to the device via Bluetooth. From there, the carer can set tasks linked to food, clothes, school and the household so that the device will take the child through the steps.

CONCEPT FEATURES



Viability & Feasibility

technical viability

electronic components:



vibration motor



battery



microphone



E-INK display

The above components would be required to make the device work. All these components are easily sourced and it would be possible to obtain them and use them when manufacturing of the device.

mechanical components:



Scissor linkage is a tried and tested mechanism, meaning that it would definitely work to move the back out, providing that the links and bolts are strong enough to sustain the movement.

viability rating



financial viability



£2



£12



£5



£30

These are some of the prices of the electronics taken from online research, showing that the overall cost will not be too high, meaning that it will be feasible for carers to buy it for the child. The materials being used are primarily polymers and metals, meaning that they can easily be sourced

viability rating



Overall, the product does appear to be feasible in terms of technical and financial viability. Further feasibility studies will be conducted later on in the design process