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Dinner Time!

"How to support children with autism spectrum disorder and their parents in better eating habits?"

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Abstract

Children with Autism spectrum disorder often encounter problems regarding their eating pattern. These problems are often stacked on top of different implications originating from their autism spectrum disorder. In Twente, these children and their parents are able to receive a helping hand from a specialist from Forza in their current situation. However, a tool that is able to deliver support whilst Forza is not present is desirable for both parent and child. This research project further examines the potential to use a game in the form of an application in order to support both parent and child with the child's eating problems. A prototype of a farming game application was created and then evaluated together with the target group of children with autism spectrum disorder and eating problems ranging from 8-12 years old. The result of this evaluation suggests that the means of using such an application could contribute towards supporting the child and parent in their current situation. There are however some limitation and lot of possibilities left for future research purposes to come up with a final product that could contribute as a supporting factor in real-life.

1. Introduction

Almost all toddlers encounter phases in which eating is problematic. During these phases children refuse to eat certain, or in some cases all, types of food. Often, these phases are short and have no long-term effects, but in some cases such phases last longer, leading to shortages in essential nutrients and vitamins. As a result, these children might face serious health problems, such as overweight, heart diseases, tooth decay and eating disorders [1]. This shows that the problem at hand is serious and can result in dangerous health complications. Children with autism are proven [2, 3, 4] to be a subgroup that are particularly sensitive for these problems. This is most likely due to the fact that these children do not respond positively to big surprises but rather keep their own control over a situation, so when they do not have this they tend not to cooperate. When these phases are long-term, simple solutions such as rewards and encouragement are no longer a vital solution and are often even counterproductive [5].
ZGT is helping children and their parents to tackle this problem, the organization delivers tailored help in which assistants deliver at-home assistance, examples are: coaching for parent and child; worksheets for the children; and specific strategies like the 'tea-spoon method' [6]. However, autistic children are still a very hard subgroup to help and ZGT would like to change that by the usage of a technological intervention.

The biggest challenge in the current situation is the subgroup of children with autism, since these children need a very special treatment. Some characteristic of these children is that they need a sense of predictability, but contradictory to that they need a sensible dose of surprise in the actions that they are performing to keep things interesting enough. Currently ZGT makes use of worksheets for parents and children, these are meant to keep track of the eating pattern and the types of food the children consume. To add up to that the families receive tailored help in the form of ZGT caretakers watching and talking to both parent and child. The employees of ZGT have experienced a lot of situations in which the child is surprisingly keen about technology and enjoys interacting with a piece of technology. Because of this, ZGT wanted to find out whether it was possible to easily reach the children and solve the problem of eating disorders through the means of a digital or physical intervention that is meant to stand in between the child and his/her eating pattern. The challenge therefore is: to create an intervention for autistic children with eating problems by the use of technology.

This document will portray the entire path of discovering and creating an intervention that suits the needs of the stated problem. The journey starts off with some extensive research about both the subject and the state of the art, this information will serve as the foundation for the rest of the project. When this is finished the ideation phase is initialized and a collection of ideas will be created, these will be narrowed down into one final idea that will be realised and tested. Finally, the project will be evaluated; conclusions will be drawn; and remarks for future work will be presented.

1.1 Research questions

In order to have a guided research on the background of the challenge stated above, a concrete research question supported with sub question are needed. In the research question the most key aspects of the challenge need to be included, in this challenge those are: children with autism spectrum disorder; problems with eating; a technological intervention. The combination of these aspects and the challenge stated above were used to create the following research question:

“How to support children with autism spectrum disorder and their parents in better eating habits?”

1.1.1 Sub questions for background research

The goal of the research question is that if it is possible to give a decisive answer to it, it will deliver enough guidance to develop a suiting solution for the challenge. However more information is needed about specific parts of the question to be able to effectively answer the main research question, therefore multiple sub questions need to be answered first. The sub questions that are specific for the background research are:

How can children with autism spectrum disorder be characterized?
Understanding the characteristics of children with autism spectrum disorder will contribute for this project, as they can unveil possibilities and pitfalls.

How are eating problems related to children with autism spectrum disorder?
It is important to understand the relation that children with autism spectrum disorder have with eating problems. Understanding the relation of ‘typical’ children in is also part of this sub question, to be able to further explore how autistic children differ in this aspect.

How can a piece of technology contribute to support autistic children?
If the end result is a technological intervention it is important to know whether it is a viable strategy at all, and in what way it could be implemented effectively.

What interventions are currently available in the field of autistic children with eating problems, and what makes them (in)effective?
The current field can deliver some interesting insights into features that are either effective or absent. In addition to that, the ideas used the current field could inspire for future ideas.

1.2 The scope of the project

For the sake of clarity and effectiveness it is key to define some borders in which the research and development will operate, the scope of the project. In order to define the scope of this project, several sources are at play. Firstly, there have been multiple online conversations with caretakers of ZGT, who were asked several questions about the characteristics of autistic children. For example, information such as the development and interests of children with autism at specific ages was an important factor to define the age group that this project will focusses on. Secondly, the research that forms the background chapter of this document provided some insights on possibilities and pitfalls. An example of this is the ways in which autism affects a human and what diagnostics could be focussed on. Lastly, some outside sources such as input from the supervisors of this project were used to clearly define some important borders, such as defining the term 'technological intervention' which is explained below.

Here are some important borders are stated that help to define the scope of the project:

- The age group that the project is focussed on is 8-11 years old. This is the chosen age group because the children are old enough to handle more complex thinking than a toddler or baby. On the other hand, these children are still malleable into new behaviours. They have not hit puberty and are yet to differentiate from each other, making it possible to make an intervention for a broad spectrum of the group.
- For the project the focus will be on children with the classic form of autism, high-functioning autism disorder in special. This is one of the most common and reachable type of autism as other types are hard to define or too severe.
- 'Technological intervention' could mean a lot of different things, this can be confusing and counterproductive. Therefore, it is important to set in stone what is meant with the term 'technological intervention'. A technological intervention in the scope of this project is something that is contributing towards a behavioural change by the means of a digital or physical medium. A digital intervention could mean an app or a virtual buddy, physically the spectrum of possibilities is broader as for example an interactive speaker or a responsive light could be a possible intervention. It is important to understand that the intervention should contribute to solve the problem at hand, so a doorbell would not be part of the term 'technological intervention' as it does not contribute towards the solving of the problem at hand.

2. Methodology

The project will be divided into several different phases which will serve as a guideline for the researcher. In this chapter an overview is given on the specific phases and the methods used to come progress through the project are elaborated. This is done in order to create an overview of the different methods and that are used for research, data collection and analysis.

Background research

The background research is meant to create a better understanding of the current situation. The research is divided into two separate parts. The first part will consist of an extensive review of available literature about specific topics of interest. The literature is gained from the internet and consist of both academical and non-academical sources. The seconds part consists of an 'State of the Art' research in which the internet, google play store and iTunes app store are used as sources.

Ideation

During the ideation phase a great variety of ideas will be generated and afterwards downgraded until only one final concept is left. The process of generating of the various ideas is engaged with different brainstorming techniques which are further discussed in the chapter. Downgrading the ideas is performed by making use of a feedback session with experts and a feedback session with potential end-users.

Specification

During the specification phase the final concept will be further specified in order to come up with a 'blueprint' for the functional prototype. The main features that need to be present in the prototype are further elaborated and requirements for the prototype are created that could be used during the evaluating phases of the project.

Realisation

The prototype was created during the realisation phase of the project. The main pieces of software that were used are 'Adobe Illustrator' and 'Axure RP 9' and enabled the creation of a fully functional prototype. During the realisation the prototype was tested with peers and experts in order to find potential gaps and bugs.

Evaluation

The fully functional prototype was tested during the evaluation phase of the project. Four sets of participants (parent and child) were included in a study in order to evaluate the means of using such a concept for their current situation. The information was then analysed by making used of a thematic analysis.

Discussion + Future research

The result from the entire project was discussed in this phase of the project. A critical outlook is placed upon aal the findings in order to come up with concluding remarks about possibilities for future research.

Conclusion

Lastly, the main findings that are discussed in the discussion chapter will be presented in a conclusion. The conclusion will provide the essential overview of the main findings to the research question stat in the beginning of the project.

3. Background

3.1 Autism spectrum disorder (ASD)

In order to develop an intervention that is suitable and effective in helping autistic children with their eating problems a better understanding of the condition is needed. Autism does not have a specific cause, but is rather determined [7] by a combination genetic risk and environmental factors that influence development of the brain in early life. Humans with 'Autism spectrum disorder' (ASD) may encounter problems with [8, 9]: communication; the inability to function effectively at school or work; and social interactions. In general, 'Autism spectrum disorder'(ASD) is used to describe the condition at hand, however [10] not every person with autism has the same form of autism spectrum disorder.

In the past there existed a division of specific disorders [11, 12] within the spectrum. However, 2013 the fifth edition of 'Diagnostic and Statistical Manual of Mental Disorders' (DSM-5) was introduced, making an end to the division [12, 13]. It important to know why the specific division between "Autistic Disorder", "Asperger Syndrome" and "PDA" does no longer exist [12], because the reason shows a pitfall that ought to be avoided. The different disorders were vague and were hard to diagnose as not every person with autism could be specifically diagnosed with one of the disorders due to the fact of variety in symptoms [12]. The pitfall would therefore be to think inside the limited boxes of certain diagnosis within the spectrum, as every person is different. This research will therefore not focus on the existing diagnosis of the spectrum but rather the symptoms that are assessed for a diagnosis.

In order to perform a DSM-5 diagnosis, the following criteria are assessed [13]:

A. **Persistent deficits in social communication and social interaction across multiple contexts, as manifested by the following, currently or by history**
B. **Restricted, repetitive patterns of behaviour, interests, or activities, as manifested by at least two of the following, currently or by history**
C. **Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities or may be masked by learned strategies in later life).**
D. **Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning.**

When performing a closer examination of these criteria some symptoms come to the light that are able to characterize an individual with ASD. Deficits in skills regarding social communication and interaction is one of the characteristics. It is known [14, 15] that individuals with autism have trouble functioning in the domain of social skills, making it hard to communicate with others effectively. The social incapability's are formed early in life, as children with autism do not mimic behaviour of peers as much as 'typical' infants [15]. As a result of this backlog the so called "theory of mind" [15], which is essentially the experience gathered from social interactions, is a lot smaller for individuals with ASD. This results in a reduction of capabilities such as: not understanding body language; interpreting words and understanding of emotions [15, 14].

Another one of the characteristics that can be subtracted from the criteria is 'restricted or repetitive behaviour'. When talking about repetitive behaviour a division could be made between low-order and high-order repetitive behaviour [16]. Low-order repetitive behaviours are more physical such as performing certain movements; vocalisations such as grunting; and fidgeting [16]:. High-order repetitive behaviour on the other hand is more mental, for example: necessity of routine and intense interests [16, 13]. Repetitive behaviour is often one of the first signs of autism, making is one of the most known characteristics upon society [16].

One of the criteria mentions that the symptoms at hand need to cause clinically significant impairment in an important area of functioning [13]. As stated above one of these impairments can be the lack of skills in social interactions or communication, but there are more possibilities. Intellectual impairment occurs significantly [7] more often with individuals with ASD, making it one of the impairments mentioned in the DSM-5 [13]. Linguistic impairments are more common among individuals with ASD and can vary from slight to severe [17], where severe impairments can go as far as being unable to communicate verbally at all [18]. These impairments can clearly empower one another as for example the inability to interact socially or express oneself verbally could contribute towards intellectual impairment.

Intellectual impairments can be empowered by the inability to concentrate, as keeping concentration is a prime skill that contributes to learning. Especially for children with ASD it is very hard [19] to stay concentrated, as it is hard for them to filter the distractions out of a situation. Interest is suggested [19] to be an important factor contributing towards the inability to concentrate, as it is easier for children with ASD to focus on things that are considered ‘fun’ [19]. Limitations in the ‘central coherence’ [20], which is the process of connecting information to different parts of the brain, can also play part. Due to a decreased central coherence, individuals with ASD have [20] difficulties with differentiating between main substance and side substance, making it hard to determine where to focus on. In addition to this the ‘executive functions’ [21] of children with ASD are limited, these functions determine the ability to perform planning and strategize in situations. The result of being unable to plan and strategize correctly could be that making time to perform novel actions difficult, with routine and written down plans as a viable strategy against this [21].

3.2 Autism and eating problems

Almost all parents encounter situations in which their child throws a tantrum over their food or refuses to eat certain types such as vegetables at some point in the life of their child. However, children with a form of ASD are often significantly [22, 2, 3] more problematic and the problems at hand are often more complex than with typical children. In addition to that it is proven [22] that children with ASD have a significant higher chance to have problems with FNPE at some point in their lives as opposed to their 'typical' siblings.

Parents or other caretakers are the first line of defence against eating problems but their actions are often invalid or counterproductive [5]. With autistic children there are a lot of issues at hand that are in dire need of extra attendance from caretakers, problems often entail the overall compliance of these children [3]. When children are eating enough to stay alive and healthy for the time being the parents tend to focus on these other issues and attend to the eating behaviours when the other problems are solved. The problem with this is that the issue at hand is becoming more severe and nested within the child as it takes more time to settle, letting the small problem escalate [3] into a more severe one.

Children with autism seem to be more prone to encounter problems within their diet as opposed to children with a typical development. As stated before a cross-section [22] research has proven that children with ASD are significantly more viable for eating disorders as opposed to their closest typical siblings. There are several issues that can either create or empower the problems of picky/fussy eating with autistic children, these mark the gap between a child with ASD and a typical child: [3, 23, 2]

- When a child has **sensory sensitivities,** a child will prefer and shun particular textures.
- Children with ASD like **routine**, therefore eating the same food every day.
- **Trying new types** of food is hard, as it is not part of the routine.

Making a distinction between sensory sensitivities and picky eating can be hard, as both can be characterised by the low variety in 'liked foods'. The main difference is however that individuals with sensory sensitivity will encounter a so called 'sensory overload' [24] when trying new foods, whilst picky eaters do not. A sensory overload can be divided into different forms with sensitivity to texture as the most common followed by sensitivity to smell and taste [24]. Typical children that are still in development do also have sensory sensitivities but they outgrow them rapidly, whilst children with ASD need a lot more time [25].

There are multiple ways of creating a safe environment for children with sensory sensitivities to try new foods and suppress the sensory overload. It is very important [25, 24] that children do not feel pressured, as this creates a tension around mealtimes that will result in overly sensitivity. In addition to that, pressure feeding is suggested [5] to be counterproductive when trying to make a child eat. One should not entirely focus on the end goal of making a child eat a certain type of food, but rather the small steps that contribute towards that goal. Making use of small daily steps is a viable strategy to lower the sensory overload [24], the steps could be (in order): smell, touch, lick, hold, chew and reward [24, 25]. It is important to note that reward is however a risky strategy because it can work counterproductive [5]. Another strategy that will help the cause of eating new foods is making mealtime more fun, by exploiting activities such as playing with food and cooking [25, 24]. Lastly, the new type of food can be placed on a 'trying plate' [24] which creates a division between the normal meal and the new food, letting the child eat the new food when he/she is ready to do so. These strategies are interesting to keep in mind when entering the ideation phase.

3.3 Autism and technology

Since the general idea of this project is to create a piece of technology it is important to further explore the combination of autism and technology, it is important to know whether this could be a viable strategy against ‘Food neophobia and Picky/Fussy eating’ (FNPE). It is shown [26] that virtual agents can provide children with ASD with more engagement within the intervention, making it more effective to reach its goals [27]. But what are other possibilities within the usage of technology with ASD children?

Virtual pieces of technology have the properties to be accessible in a lot of situations, let us take an application on an iPad as an example. The application could be used at any time of the day without further restrictions, this is way more accessible as opposed to the help of a caretaker who has to take some of their useful time away to intervene [3]. To add up to that, a virtual application could be more effective and less emotional in the progress. Lastly the use of applications could make the purchase of a single iPad be worth as it can hold multiple applications at the same time. It is multi-facetted; it can deliver support for multiple issues at once [28].

A virtual environment can used to help children try new things, granted that children feel safe in the created environment [29]. Artificial intelligence, virtual reality and augmented reality are proven [26] to be a comfortable environment for children with ASD to try out new things, whilst promoting constant learning for these people. As the possibilities with for example virtual reality are endless, the intervention could be tailored to the desires and needs of a child with ASD, making it more effective. An example of this could be that a setting is created in which less stimulus is present, which will enable the child to behave more controlled.

A peer can often be very effective [30] to help and work towards a goal, therefore the idea of a virtual peer is an interesting idea. A virtual peer could for example be a small character inside an app that tries to motivate the user to push further when they need this. A virtual peer can be created into whatever the child likes, this creates endless possibilities and can encourage engagement with that peer. Not only does a virtual peer give encouragement to push further, a virtual peer could also help in the development of basic social skills [30].

3.4 Children, Food neophobia and picky/fussy eating

As part of the research, it is important to understand the workings of disruptions in the eating pattern of children. As part of an academic writing course, a literature review was conducted to get a better insight on the problem and its origins. The entire review can be found in appendix A.1, where the concepts are elaborated into more detail.

Summary of main conclusions [5]
Food neophobia and picky eating are similar to one another and both revolve around the general concept of having a disruptive eating pattern. Almost all children encounter phases in which they develop and maintain disruptive behaviours regarding food intake around their 3rd year of age. This is most likely due to the fact that the children develop the ability of complex thinking during these ages. It is therefore key that actions are taken during these phases of childhood as they are prone to define the further eating pattern of that child's life.

There are different influences that contribute to either the increase or decrease of food neophobia and/or picky eating. Major influences can come from the parents of the child at hand, who can be seen as the first line of defence or offence towards the disrupted eating pattern. Parental influences such as pressure feeding, rewarding and restricting are proven to work counterproductive towards solving the problem at hand. On the other hand influences such as a healhty food environment and family participation during dinnertime could greatly contribute into supporting a more healhy eating pattern. Antoher great influence is gained from familiarity with foods. Enriching the child with both knowledge and positive experiences with novel foods can contribute to increase the willingness to try new foods for these children.

3.5 State of the art

For any project it is very important to create a so called ‘state of the art’. The state of the art consists of all the currently available possible solutions to the problem at hand, regardless of the effectiveness of that solution. By creating a state of the art two important pieces of information will appear:

1. There is a clear overview as to what is missing in the current field
2. There is a possibility to find out new effective features and features that are ineffective.

With the state of the art complete it is possible to enter the ideation phase where the newly found information could be merged to obtain new ideas.

The state-of-the-art research was started off by looking through the app store and find apps that were most popular and fitted two or more of the aspects for this challenge (children, eating, autism), these are listed In Appendix A.2. In the sense of this research, the most popular apps mean the ones with the highest rating and download amount. There are hundreds of similar apps to find but for the sake of repetition and complexity a selection was made that includes the most popular apps and unique apps. An app is considered to be unique when it contains a specific feature that is not included in another included app, even if the core concept of the app is similar to another included app.

After the examination of apps comes the ‘physical’ category, with some physical technologies that do or could contribute are listed. For every existing technology the document includes: the name of the app; a link to the app or developer; a short summary about the app; the availability of the app; the cost; the pros and the cons. Note that the pros and cons are distributed with regard to this project, not the original project of that application. Afterwards a small summary will portray the extensive research and conclusions will be drawn from the information found.

It is important to understand that not all the apps and physical technologies are directly developed for the purpose of battling FNPE with autistic children. Some might only focus on one of these aspects, whilst others might not even contribute at all. The pieces of technology that are included in the list merely serve the goal of examining the possibilities in the field. Something that is not created to remedy one problem could be slightly reworked to serve as a system that helps to solve the problem, as long as the potential is there.

3.5.1 Apps

3.5.1.1 Covering the entire field

In this list [Appendix A.2] 12 apps are both examined and judged for their contents, but how does that cover the entire field? There are hundreds of other apps that are equally interesting and come close to the apps that are shown above. It is however not possible to assess all the apps available as that would both be very time-consuming and inefficient. These apps might numerically only take up less than 1% of the total apps, but they determine a sufficient image of the field. For example: if there are 200 apps filled with recipes for children, assessing only one of them is sufficient as they convey the same message and support. By performing extensive expediting through the various app stores this selection was made, which will be sufficient to sketch an image of the current field and its components.

The judgement of the applications is based on the features that are included inside the application. Reoccurring features are withdrawn from the pool of applications and given either a '+' or '-' to visualise the quality of an app. It should however be noted that the core concept of one app will differ greatly from the concept of another, the ratings are purely to envision what is currently widely available and what is not. The results can then afterwards be compared and general features that tend to be effective could be concluded from the state of the art, accompanied with additional research.

3.5.1.2 Main findings

It is key that conclusions are drawn from the applications examined above, as by doing some concepts about the field become clear. One thing that can immediately be concluded is that there are no existing apps that focus on autism, children and food at the same time. There are a few that focus on one of the aspects but there exists a gap in the market of apps, making the creation of an app for the cause of autistic children with eating problems a frontier. There are some valuable features to be exploited from the existing apps, for example 'PR eating disorder management' [31] can serve as a template for features such as: creating a platform to come in contact with professionals; a platform to share your victories; and a focus on eating disorders. The app is however focussed on adults and has some gaps, but these can of course be filled, either by the inspiration of other existing apps or a completely new feature.

There are two main features that often seem to be lacking in the existing field of applications:

- **Interactivity** is important when trying to keep the user of an app engaged with the activities that the app creates. It is suggested [32] that making the application more interactive the user tends to be more proactive and might respond better to the support that the app gives. In the current field there is not a lot of interactivity in the apps that serve a supporting value. Apps that are more focussed on mere play and joy instead of helping against a problem tend to be more interactive, the supporting/educational apps are less interactive. It is an interesting option to tie interactivity and support with one another in a new application.
- **Progression and reward** can [32] contribute with the success of an application, by encouraging the user to push further and return to the application. Without progression the user will likely feel a degree as repetitiveness as the same actions will occur over and over, making it less likely that the user will enjoy the interactions in the long run. To add up to that does the lack of progression not give the user a feeling of reward as there is no feedback as to whether there are improvements. Reward is however a treacherous path to walk as it could serve counterproductive [5] to the cause of autistic children and FNPE, therefore caution is advised.

The use of a mascot is something that some of the apps utilized to try and create a larger amount of engagement with children. It is therefore no coincidence that the apps meant for children were often combined with a childish mascot. 'Taste with tiny' [33] made interesting work of this by letting the mascot eat together with the child, whilst encouraging the child to push further. The usage of a mascot is an interesting addition to the application in the case of children, and should therefore be considered to add.

3.4.2 Other

3.5.2.1 Main findings

When examining the existing field in the ‘physical domain’ it immediately becomes clear that there exists a big gap in technologies, as none of them are getting close to the core of the problem for this project. This can of course be seen as a big opportunity since this project could be a pioneer into filling the current gap, but there might be good reasons for the nonexistence of technologies. An argument could be that the development of an app is often far less expensive and time consuming, whilst a piece of physical technology could easily become quite expensive [34, 35]. It is of course true that this greatly depends on the complexity of the app or physical technology, but could be an interesting argument when finding out why there are more apps than physical technologies. The ‘market’ for children with autism and eating disorders might just not be large enough to make a potential profit with a physical piece of technology, but is promising for an app (if not too complex [35]). Note that this does not mean a physical piece of technology should be excluded from the equation, as the goal of this project is to develop something that ‘works’ above financial profit.

There are only a few pieces of technology that show potential for the field and only one of them is actually meant to serve as support towards an aspect of the problem. Technologies such as ‘Cozmo’ [36] and smart speakers [37] can serve as an inspiration for a new piece of technology, but are currently not able to contribute as they are developed for other purposes. The main finding is that these pieces of technology come with a high value of interactivity and engagement, which might help to encourage improvement. The ‘board game plate’ [38] is the most interesting piece in the list and could contribute to children eating the food that their parents present, but just serves as an inspiration as it is very simple and will become repetitive.

3.6 conclusions

The background research has shown that there are currently not a lot of options available for personal use when it comes to the specific current situation. There are a few applications available that could contribute to a part of the current situation, but none that could support to the specific situation. This might be due to the large diversity within the target group, as every child with autism spectrum disorder has different implications with different severities [13, 10]. There are however some core-characteristics that could serve as a guideline to account for the greater part of target group. These characteristics are [3, 2, 23]: sensory sensitives, repetitive behaviours, concentration problems and impairments. Keeping these characteristics into account during the design of a concept should go a long was into satisfying the user and increasing the potential effectivity of that concept.

It was also found that there is a high potential for technologies such as applications, which should help to motivate the child more [28, 29, 26]. Making use of a virtual peer is a specific feature that could also contribute to a positive experience for the user [30]. Incorporating such a feature might be interesting and useful. In addition to that it could be a viable strategy to increase the familiarity of the child with specific foods in order to increase the willingness to eat these specific foods [5]. Techniques to do so could be by giving them more educational content about these foods, or actually show these foods to the children. It is however important to make sure that the child is not pressured but rather motivated as pressure could lead to counterproductive behaviours [5].

4. Ideation phase

Now that the background research is completed and the field of interest is known, it is time to enter the ideation phase. During the ideation phase new ideas and concepts will be generated. The ideation phase starts off with a converging part in which the field of thinking constantly extends into different branches, creating a large number of ideas and concepts. This will be achieved by different brainstorming techniques such as: mind-mapping, word-storming and role storming [39, 40, 41]. After the ideas are generated the diverging phase starts, in which the number of ideas and concepts (generated in the converging part) will be narrowed down until only one specific concept is left, which is the final concept that will be further specified and realized.

4.1 Outline of the ideation phase

To make sure that the time spent in the ideation phase is effectively used, a path is created beforehand. This path is purely there to give a guideline through the ideation phase, to make sure that the designer knows what the next steps will be so he/she can anticipate on this. The guideline for this project is visualised in the picture below. The red blocks and arrows visualize the main path that will serve as a guideline for the researcher, with some additional elaboration on the effects and/or goals of the blocks. The final red block marks the specification phase of the final concept, which is the end-goal of the ideation phase. Note that the orange box depicts a tinkering process that occurs during the entire ideation phase, especially during the phases in between moments of feedback.

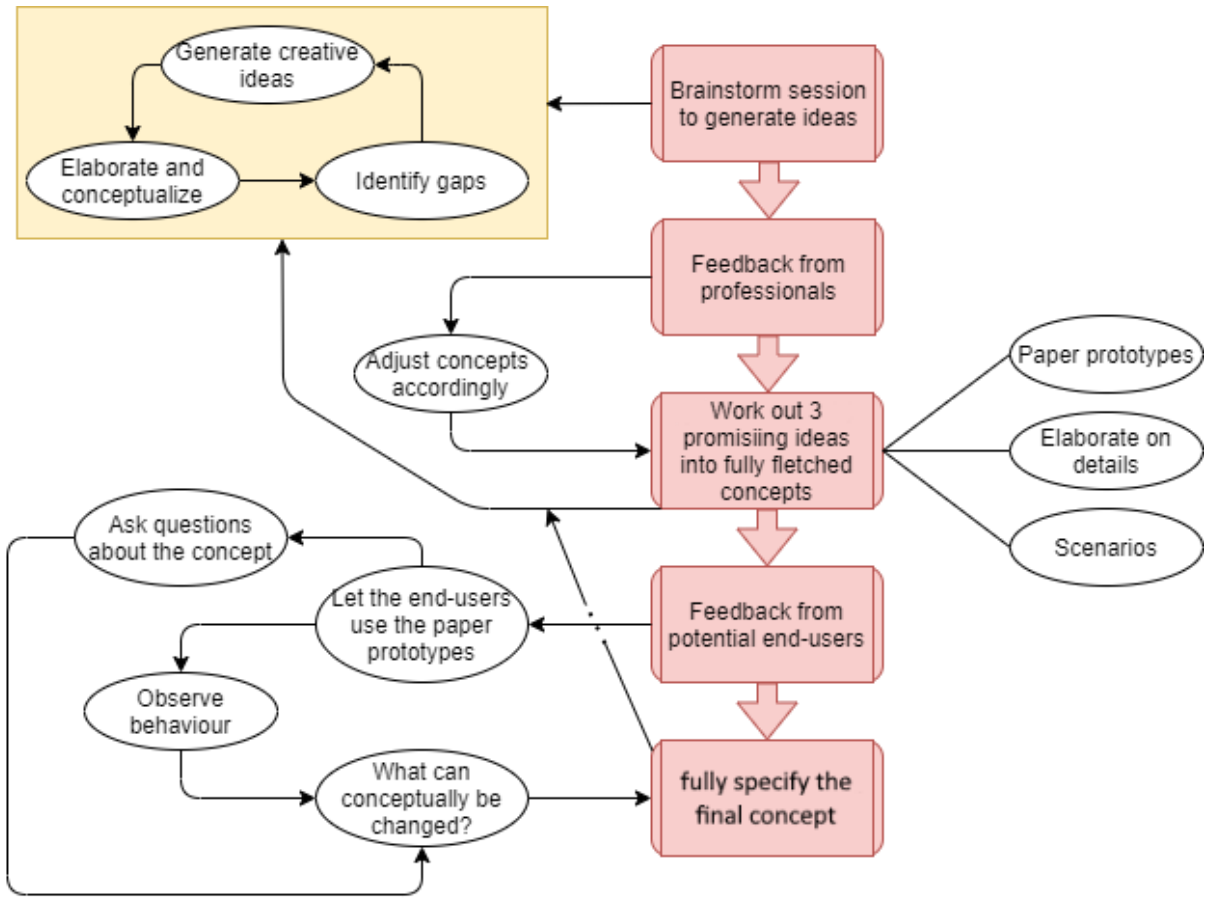


Figure 4.1: roadmap of the ideation phase, which results in the specification phase.

The ideation phase starts off with brainstorming sessions, to generate ideas based on the background research performed beforehand. The research will be visualised into a mind map with both interesting features and factors that need to be accounted for. The mind map will then serve as a tool to generate creative ideas regarding the subject, as it is easy to pick a certain point of the mind map and start brainstorming from there [42]. The idea will then be slightly conceptualized, a small description on how it would work and what purpose it would serve. It is however possible to then identify gaps when for example an important factor is not accounted for. To fill that gap, a new creative solution is needed, making it an iterative process that constantly loops. But one needs to make sure to exit the loop after a certain amount of effort/time, because this step is more about the number of ideas rather than the elaboration of it.

When the brainstorming is completed and some viable ideas and concepts are clear, a meeting with experts (who are also the client) will be scheduled. The goal of this meeting is to start diverging, and thus narrowing down the number of viable ideas. The experts know a lot about the field and requirements for the challenge. They should be able to tell what might be a 'good' idea and what not, making them useful judges to narrow down the large number of ideas. The experts will be asked to give their honest opinion about a selection of roughly 10 preselected ideas, as it is not the intention to overload the expert with ideas. The preselection is based on the judgement of the designer himself, who can be categorized as a minor expert as well due to the extensive background research performed beforehand. Ideally the experts will be able to narrow the amount down to around 2-4 ideas, if not more experts could be contacted to form a stronger assessment of ideas. It could be possible that the experts come to the conclusion that none of the ideas are promising at all, this could mean that the process should be repeated entirely from step 1 onwards.

Now that the number of ideas is narrowed down towards only 2-4, it becomes possible to fully conceptualize the ideas. By transforming an idea into a concept, it becomes clearer what it is exactly meant to be. This starts of by elaborating on the details of the idea by starting to think about: design, usability, usage of hard/software and how it serves to the goal of the challenge. After that some scenarios could be created to give meaning to the usage of the technology: who/what/when/where/why/how will the intervention be used. Lastly the creation of paper prototypes will be used to fully visualise the envisioned concept, which will prove useful for the next step.

Now that there are only a few full fletched concepts combined with paper prototypes, the potential end user will be approached. Firstly, the participants will be given the different paper prototype and asked to start and use it. The researcher can then watch the behaviour of the user and adjust accordingly, which can be either between subjects or after all the subjects have been visited [43]. After this the participants will be asked some questions, either in the form of an interview or through a questionnaire. The response from these end-users can provide insight in which concepts work well and which do not, giving the opportunity to narrow down further towards a final concept.

Ideally there would be one concept left at this point, which could be adjusted accordingly to the responses of the potential end-users. These last specifications will help towards the next phase, which is the realisation phase in which a working prototype will be created. Once this step is finished completely, the ideation phase ends.

4.2 Brainstorm phase

The brainstorm phase consisted of two sessions which are meant to use the found information in the background research, and turn it into creative solutions for the problem of children with autism spectrum disorder and eating problems. The first session consisted of the creation of a mind map, which was followed by the second session that revolved around word-storming and role-storming [40]. These standard techniques are used to support the researcher ensure the quality of work during the brainstorm phase [44, 40, 42, 39].

During the first brainstorm session the goals was to make a mind map originating from the most important information from the background chapter and start extending with ideas and concepts. Mind-mapping is a simple way to visualise the most important information and generate new ideas from specific key aspects such as words, obstacles, opportunities and other ideas [42]. The process of generating new ideas from the existing words and ideas is called 'word-storming' [40]. In order to form the mind map, the most important requirements and concepts from the background research were used as reference points to start associating new words, concepts and ideas.

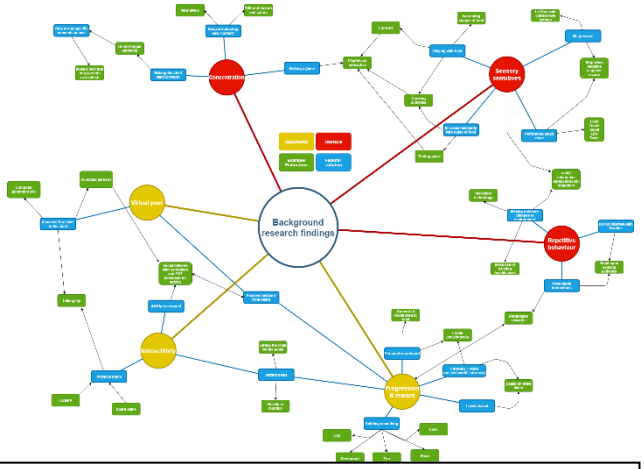


Figure 4.2: The mind-mapping started physically as this was the preference of the researcher, but the final mind map was digitalized afterwards to create a better overview. The mind map that was created for this project is projected here, a larger readable image can be found in the Appendix section [Appendix A.4].

After the mind-mapping is finished it is time to try and connect several points on the mind map to come up with new creative solutions for this project. In this phase of the ideation the quantity of ideas is still more important than the quality of them [45], as the constant process of tinkering will shave the rougher edges from the ideas. To effectively generate ideas from this mind map a minimum was set to 50 ideas, to make sure that creative solutions come above water. It is important to let the mind think freely and write every idea down no matter the quality of the idea, as this can provoke new ideas that might actually be very useful [45, 46]. In order to gather the ideas two standard techniques were used: word-storming and role-storming [40, 41]. The second brainstorm session resulted in a list [Appendix A.5] of 50 ideas which marked the starting point for the process of narrowing down towards the final concept.

Presenting a large list of 50 ideas would quite possibly overwhelm the professionals in such a way that they would not be able to deliver a well-founded opinion. The list has to be narrowed down intensively in order to make sure that the professionals understand the ideas, and are able to think clearly about each idea. Where the researcher did not take the quality of the ideas into account during the brainstorm session because the quantity was more important, the researcher will now prioritize the quality. The process of narrowing down was initialized by merging ideas and removing [Appendix A.6] ideas that could be categorized under the following characteristics of quality: not feasible; too expensive; counterproductivity; already widely available. The goal was to end up with roughly 10 ideas that could be elaborated with a small description in order to give a clear image of the idea. This process left 18 ideas from the initial list of 50 ideas, which made it easier to get a clear insight on the valuable ideas present.

Further downgrading and merging [Appendix A.5] of the ideas that passed the first phase of downgrading was now possible, as the lower number of ideas enabled the researcher to engage into more critical thinking about each idea. One of the main concepts that were important during this phase of downgrading was the 'volume' of the idea: "could this become a full concept, or is it more of a feature that could be added to another concept?" In addition to that the researcher compared the ideas and merged ideas that were of the same nature and therefore would have roughly the same effectivity. With merging the ideas would either be combined as two features forming a new idea, or eliminating the one that was deemed to be less strong based on the concepts of predicted feasibility, expensiveness and effectiveness. Lastly the researcher also engaged into the thought of using the final version of the idea, essentially starting to specify the ideas. By doing so the researcher found that some of the ideas might not comply with some of the requirements that were found as a result of the background research. For example, the idea of making a puzzle game during dinnertime that revolved around getting clues by taking bites of food was deleted due to the fact that it would be too distractive (concentration) from the actual dinner setting. This process based on comparison between the 18 ideas that were left resulted in a further reduction towards 8 ideas.

Now that a reasonable number of ideas was left it became possible to elaborate on the ideas in the form of a description without creating an excessive amount of unnecessary workload. The creation of these descriptions marked the end of the brainstorming phase and opened space for the first moment of feedback, which was received from the expert clients from Forza.

8 ideas that resulted from the brainstorming phase

1. **Manage your own farm / building game**
   Build and manage your own farm, growing crops and treating your animals. To help guide you, an older farmer or animal talks to your and encourages you to grow more crops to make nice meal from them. In order to get to new types of crops and upgrade your farm you need to use coins, which are collected during dinnertime by performing actions with vegetables or foods in general (dependant on the situation). The coins are rewarded by the parents after dinner, who fill in information about the eating progression of that day, this will be saved to be examined by professionals.

2. **Food encyclopaedia / conquer the world**
   This idea can either be physical or digital, and is essentially a large encyclopaedia with different foods. The foods are explained through fun facts and progression will be kept, as the goal is to try as many foods in the encyclopaedia as possible. A possible iteration of this could be a world map where you can choose a country and get a specific food to try, keeping score of what countries the user has visited before.

3. **Talking cutlery/toy/hat**
   This is a piece of technology that is meant to encourage the user into eating more. It should essentially become a little friend that keeps on talking and vibrating in order to make dinnertime more playful and encouraging. There are many possibilities for this idea, you can for example think about: Cutlery, stuffed animals and other toys.

4. Safe social media
Places like Facebook and Instagram are often used by people to show proud moments of their lives, to get positive or motivating responses from peers as a result. These are however not safe places for younger children, but what if a safe version would be created. A place where children can show their tasting adventures to responses and motivation from a selected group of peers, parents and ZGT personnel.

5. Grow a plant by tasting
By actively interacting with pieces of food (looking, touching, licking, tasting, eating) the plant grows a little more, with a fully grown flower as a result. The flower can either be digital or physical, depending on the complexity of further iteration and preference of users.

6. Thermometer rising to goal
This is a very large thermometer that can be placed close to the dinner table (or further away if that is preferred) to portray the progress towards a specific set goal. The thermometer is a physical installation with LED-lights that will lit up once the user comes closer to a goal. When the thermometer is full, the goal will be reached. The goal can be manually set by the caretakers of the children every time a new goal is set.

7. Car/boat/plane on track that moves with bites
A track is placed out on the dinner table with a car on the begin of it and pieces of food on specific places between the begin and end. At the end of the track a reward could be placed, that needs to be obtained by the car in order to receive it. The car can only move if an interaction is performed with the small portions of food on the track. The interactions can be set by the child and caretaker, and could increase in progression (looking, feeling, licking, tasting, eating).

8. Empty the van, to have it refilled with a reward
A small physical van is filled with a type of food. The goal of this idea is to empty the van so that it can be refilled with something more fun (potentially a reward). Other iterations of this are also possible, but the general idea is that something is filled and needs to be emptied in order to get a reward.

4.3 Feedback from professionals

On the 24th of November 2020 a single meeting took place between the researcher and two professionals connected to Forza. During the meeting the professionals were asked to give their opinion about 8 ideas combined with the small descriptions shown above. The goal of the meeting was to bring back the number of ideas to about 3 most potential ideas. These ideas will then be conceptualized to become clearer and a visualisation will be added. These will then be presented to potential end-users to come to a final conclusion.

4.3.1 Procedure of the interview

The attendees of the interview were contacted through a prior meeting in which they agreed to give their opinions about the ideas for research purposes. A digital connection was set up and recorded in order to effectively distil the findings at a later point in time. After the data was extracted from the recordings in an anonymous manner, the recordings were destroyed. The researcher wrote down all the statements that the professionals made about the ideas, and combined them into the different paragraphs per concept. The experts received the 8 ideas 1 day prior to the meeting and were asked orientate themselves and form an opinion about it. During the digital meeting the experts were given the ability to ask questions about the ideas before they were asked to answer some specific questions to find out what their opinion exactly was. They were asked the following questions:

- In what way do you think this idea would contribute to the support of autistic children with eating habits?
- Would you like to add something to the existing idea?
- Are there bad aspects? If so, what are they?
- Are there good aspects? If so, what are they?
- Could you give a grade to the idea?

After the questions, the experts were asked to pick a selection of around 3 ideas that were in their eyes the most promising of the 8. These opinions would then be taken into account when decreasing the number of total ideas, making it possible to get closer to a final idea.

4.3.2 Feedback per Idea

The experts were very positive about nearly all of the ideas, they thought they all had some potential and were creative solution for the problem of children with autism spectrum disorder and their eating problems. However, when asking the questions, it was quickly found that there was one specific idea that had, in their eyes, the most potential of them all. Many of the other ideas seemed to be more of a feature that could be added to that one idea. Because of this, they were unable to take a top 3 as they suggested that only this idea should be presented to the potential end-users, with several different iterations in mind. They suggested that a few of the remaining ideas would have some potential, but those ideas focussed on a younger audience in their opinion.

Idea 1: Farming app

This idea was perceived very well by both experts, making it their overall favourite. The application has a lot of aspects that in their eyes will contribute towards the support, whilst still being enjoyable. They added a lot of new possible improvements such as visual progression, a shed and farming animals to the existing idea. Sometimes the new improvements were originating from other ideas in the list. The professionals did mention however that the idea did not seem completely original, as similar games such as Farmville already exist. However, with additions such as tracking progression for the professionals and educational aspects could easily set this idea apart from the existing apps. Another thing that was perceived very well by the professionals was that this enables the child to go back to the roots of the vegetables they consume, as the crops grow on a farm. They did however think that more features should be added in order to make it effective enough.

Idea 2: Food encyclopaedia

The professionals enjoyed the idea of having a lot of different types of food in a central place, with information about it to create more familiarity around these foods. However, it was hard for them to envision the children actively participating in this idea. They added that it would be very easy for a child to ignore the existence, and ignore the foods that they do not enjoy. The parents could help to make sure that the children participate consistently, but that would mean they still carry a burden upon them. In order to make sure that this idea would work the professionals stated that a meaningful impulse need to be added.

Idea 3: Talking hat/toy/cutlery

The idea of a talking toy or device was perceived differently between the two professionals that were interviewed. One of the professionals stated that the talking device would be interesting at most, but would not ask for enough participation of the child. While another professional focussed more on the motivational power the talking toy/device could have on a child, if designed correctly for that child. One thing that they did agree upon was that this idea was more suitable for younger children than the ones this project focusses on. It is a very playful idea and could help and support the parents, but older children will not likely respond with much participation in their eyes.

Idea 4: Safe social media with parent and Forza

Creating an enclosed social media in which children could connect with close family, friends and caretakers from Forza was an idea that the professionals found interesting at most, but only for other groups than autistic children with eating problems. The professionals were clearly against this idea because they would not like to teach the children that social media are a safe place, as usage social media by children in general are already a problem that parents often struggle with. Because of this the peers placed the idea on the bottom of the list, even though they did understand the motivational properties it could uphold.

Idea 5: Growing plant
The professionals needed a little bit more elaboration for this idea before being able to correctly assess it. When they could get a clear grasp on the purpose of this idea, they doubted a lot between making it digital or physical. As a physical version of a growing plant (not alive) could be motivating as it is always there. It becomes hard for the child to ignore the growing plant in the room. A digital version could in their eyes however be expanded in such a way that the plant would grow various vegetables and nuts that could contribute to increase the familiarity of the child with these foods. When concluding they added that this was something that could get boring very quickly after growing the plant once, especially for a physical implementation.

Idea 6: Thermometer rising to goal
The idea of a thermometer that rises towards a specific set goal was a perceived a little better than the plant initially did. The professionals found that the ability to set your own goals was a very useful addition, children would be motivated way more when they could work towards goals they set themselves. A physical representation for the progress towards that goal could make sure that the child cannot ignore the goal that was set, and will add a lot of clarity for the child. But besides that, the thermometer does not add much to the situation. It is not playful at all, and could therefore become repetitive and boring quite quickly. The addition of saving progression could make this idea a lot more interesting in the eyes of the professionals.

Idea 7: Playful interactive plate
Having a playful and clear way of portraying the food that has to be eaten in order to empty the plate was something that spoke to the professionals in a positive manner. The idea at hand is very playful and clear in the eyes of the professionals, and different versions could easily be made to suit more children. The professionals did however doubt whether children from a slightly higher age group would enjoy this idea, it could get a little too childish. Overall, the professionals were very positive about this idea, as it was a very good stimuli to make mealtime more enjoyable and clearer.

Idea 8: Reward in a prison with lock
The professionals found that the idea of imprisoning a piece of reward was an interesting manner of trying to motivate the children to eat their vegetables. Adding the ability to see the progress towards opening the prison would give more clarity and make it potentially more effective. What was interesting is that they enjoyed the fact that subject was further away from the topic of food in itself. The professionals stated that this could greatly contribute to the attitude of the children toward the intervention.

4.3.2.1 Discussion of the feedback
At the end of the meeting, I asked the professionals to take 3 ideas that were the most promising and told them that these would be showed to the potential end-users. However, the professionals thought that this was not in order, and that solely the first idea (managing a farm) was worthy enough. The other ideas were either not specifically for the age group or were deemed as features instead of standalone concepts in their eyes.

Something that was noticed during the interviews is that the professionals suggested that multiple ideas could be added to the first idea instead of standing on its own. It is important to discover the origin of this, as it could either show whether there really is one winner or a bias might exist. In order to find out whether a bias has driven the professionals towards the first idea two important parts need to be checked: the descriptions of the ideas that the professionals have read; and the reasons why they did not like the other ideas as much.

By diving deeper into the arguments that the professionals have given about the ideas, other than the favourite one, it becomes possible to find out what aspects/features they deemed most important. When reassessing the arguments that the professionals have given it could be stated that two different aspects/features were of big importance to them: childishness and interactivity. Most ideas did have either a childish edge to it or were not as interactive as their favourite idea. Even though instructiveness if proven to be a positive factor, a less interactive concept is not necessarily ineffective. In addition to that childishness is perceived differently between users, one child might not react positive to a specific extent of childishness whilst another would react negative. Even though these factors are very important to keep in mind, they do not define the ideas as much as the professionals might have defined it.

Another part of the interview that might have created a bias in the choice of ideas are the description of the ideas, that were given to the professionals beforehand. If one of the ideas was extensively clearer than the others, it would be much easier to envision that specific idea as compared to the others. When taking a closer look at the description it becomes clear that some of the descriptions were less elaborate than the favourite one, for example the description of the 3rd and 5th idea. Other descriptions were however as detailed as the description of the most favourite.

With this knowledge it could be stated that a slight bias might have existed within the argumentation of the professionals. This does not immediately mean that the entire assessment is immediately worthless, as the argumentation about the ideas is still useful. The remarks about the ideas will be taken into account to eliminate the least potential ideas, to narrow the amount down to around 3 ideas. The remarks will also be used to rework and further conceptualize the chosen ideas.

Chosen ideas for further development

- Idea 1 – Farming app
- Idea 6 – Thermometer rising to goal
- Idea 7 – Playful interactive plate

4.4 Working out promising ideas

In order to choose one final concept for this project the three chosen idea's need to be narrowed down further towards one. In order to well-founded argument to choose one of the concepts some potential stakeholders will be asked to give their opinion about these concepts. These potential stakeholders will be selected from a pool of parents of children with autism and eating problems that are connected to Forza, which is performed by members of Forza. The arguments that these potential stakeholders deliver will be combined with those from the professionals and then used to empower the argumentation for the decision-making. The argumentation will be weighted and checked for potential skewness by the designer through an analysis to make sure that a valid argument is delivered.

To make sure that the potential stakeholders fully understand the ideas at hand, further elaboration is needed. The elaboration will occur in the form of visualising the concept and enriching the descriptions accordingly with the information acquired from the interview with experts. Visualisations could be: 3D-models, sketches, videos and pictures. For this research only 3D-models and pictures made in adobe illustrator are used to visualise the concepts for the potential stakeholders. With this conceptualisation the potential stakeholders will see the same product as the interviewer which enables a mutual understanding of the concept. The interviewer will also ask the potential stakeholders to describe the concept they are seeing in order to test the level of clarity. In addition to this the potential stakeholders will be encouraged to ask questions if something is unclear to them.

4.4.1 Elaboration per concept

These are the descriptions and visualisations that were presented to the potential stakeholders during the interview sessions. It is important that these descriptions are at the same level, meaning that the density of information they deliver should be equal. If for example one of the concepts is very clear whilst the others are not, the opinion of the potential stakeholders might be skewed or even invalid. To make sure the message of every description is equal a guideline was used to write them. They should all contain the following information: what will the concept do? How does it work?; when will the concept be used?; what is the goal of the concept?. In addition to this the words child, parent and professional are included in every description.

4.4.1.1 Concept 1 – Thermometer rising to goal

This is a large thermometer that can be placed close to the dinner table (or further away if that is preferred) to portray the progress towards a specific set goal. The thermometer is a physical installation with LED-lights that will lit up once the user comes closer to a goal. When the thermometer is full, the goal will be reached. The goal can be manually set by the caretakers of the children every time a new goal is set. The goal of this thermometer is to make the goal at hand clearer for both parent and child. Even If a goal is not reached within the set time, the progression is still very visible which makes it easy to still be proud of potential progression. Letting the child set the goals is also a very useful technique that can be used to make sure that the child is invested in the set goal.

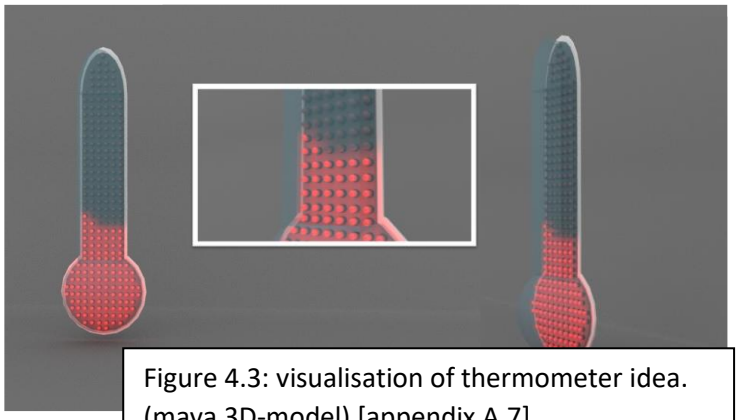


Figure 4.3: visualisation of thermometer idea. (maya 3D-model) [appendix A.7]

The thermometer is used throughout the day, as the thermometer is always visible (and might be lit all day as well). After dinner, the thermometer is updated and therefore used the most. The child can then see how far he/she still has to go before reaching the end. It is of course possible to attach a feasible reward on top of reaching the goal, but this is purely for the parents and professionals to decide. The progression could be stored inside the thermometer to be read later, or a combination with and app could be made to keep the statistics of progression. Keeping these statistics is important for the parents and professionals, as these can be used to support the care for the child.

4.4.1.2 Concept 2 – Playful interactive plate

Figure 4.4: visualisation of the plate. (maya 3D-model) [appendix A.8]

A track is placed out on the dinner table with a car on the begin of it and pieces of food on specific places between the begin and end. At the end of the track a reward could be placed, that needs to be obtained by the car in order to receive it. The car can only move if an interaction is performed with the small portions of food on the track. The interactions can be set by the child and caretaker, and could increase in progression (looking, feeling, licking, tasting, eating). The plate is used during dinnertime in addition to the normal plate of food with foods that are not problematic. If all the foods are problematic, the entire dinner could be placed on the steps.

The overall goal of this concept is to make dinnertime more fun and interesting. By using sensors, lights and decorations it becomes a lot more interesting to interact with the food than before. In addition to that, the division between the normal food and the 'trying' food becomes clearer. This will enable the child to literally see the progress, as a full plate often looks endless for the child. Seeing the prize and knowing how much is left before this price is reached gives the child a feasible idea of how much progress is made and what is needed. For the parent it becomes easier to keep track of progression as well, as specific steps are worked out and can be written down. Professionals can then use the written down progression to look at possible tactics to manipulate in the future.

4.4.1.3 Concept 3 - Manage your farm app

Build and manage your own farm, growing crops and treating your animals. To help guide you, an older farmer talks to you and encourages you to grow more crops to make nice meal from these crops. In order to get to new types of crops and upgrade your farm you need to use coins, which are collected during dinnertime by performing actions with vegetables or foods in general (dependant on the situation). The coins are rewarded by the parents after dinner, who fill in information about the eating progression of that day, this will be saved to be examined by professionals.

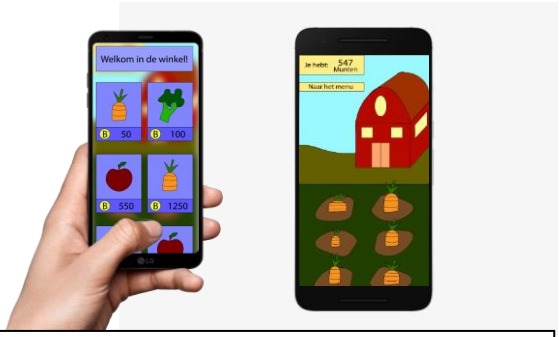


Figure 4.5: visualisation of farming app (interface mock-up) [appendix A.9]

The goal of this application is to motivate the children that use it to try and eat/taste more of their foods. The rewarding system will be based on the amount of participation revolving the dinnertime meals, making the reward higher when the child tries more. This way it becomes more interesting for a child to make that little extra step but if no steps are made, a smaller reward might still await them. The application is used for a maximum of around 30 minutes per day after dinnertime (or another eating moment of choice) in order to make sure that it will not become too addictive. The goal of this app is to combine a fun activity to the tasting during dinnertime, giving clear rewards to make progression in game.

4.5 Feedback from potential end-users

On the 1st of December 2020 three 1-on-1 meetings took place between the researcher of the project and the potential end-users that agreed to cooperate in the research. These meetings allowed the designer to elaborate the concepts before the potential stakeholders on the basis of 3D-models, pictures and descriptions. The potential stakeholders, which were parents of children with autism and eating problems, were then asked a few questions about their perception of the concepts [Appendix A.10]. The goal of this feedback session was to gather a well-founded argumentation that can be used to determine a final concept. The argumentation from the potential stakeholders would be added to those from the professionals in the prior feedback moment, creating a foundation to make a choice between the three remaining concepts. However, caution is advised as the parents did get a more elaborate concept than the professionals did, making the opinion of the professionals slightly inaccurate to the current stage of the project. Nonetheless it is interesting to at least consider the prior argumentation as an addition to create an even stronger argumentation.

4.5.1 Procedure of the feedback session

Since this phase will contain monitoring and questioning participants, obtaining ethical approval is needed. It is not possible to just start asking questions and give participants assignments to perform. The participants need to be informed in an informational brochure [appendix 11] and give consent on a consent form [appendix 12], which both need to be approved by the ethical committee. The participants were recruited though employees of Forza in order to make sure that the target group was found without making medical assumptions. Before the research started the participants were asked to fill in the consent form and received an invitation link afterwards. A digital connection was set up and recorded in order to effectively distil the findings at a later point in time. After the data was extracted from the recordings in an anonymous manner, the recordings were destroyed. The researcher wrote down all the statements that the participants made about the concepts, and combined them into a structured excel sheet. The findings that were combined in this excel sheet were used for analysis which can be found further in this document.

4.5.2 Outline of the feedback session

The feedback session consisted of a semi-structured interview to make sure that the potential stakeholders were able to freely give their opinions, whilst still making sure that a specific set of answers were at least given. Initially these feedback moments would be performed in a physical setting where the interviewer would be enabled to create a more intimate session, which should be more effective [47] when asking for one's opinion. However, due to the global pandemic of Covid-19 this was not possible, as this would not be ethically sound. Therefore, the feedback sessions were moved towards the digital realm in the form of video calls, to ensure safety whilst still maintaining a high degree of effectiveness [47]. All the ethical documents were prepared and handed in for permission of the ethical committee, which was granted before conducting the research.

The feedback sessions started with a little (off record) conversation to make sure that the participant is at ease. This conversation is ended with the interviewer stating that the participant can, at any moment, exit the interview and void the given answers. The participant will also be filled in on the progression and goals of the project to make sure that the participant knows what he/she is contributing towards. After this the feedback session will actually start and the researcher will begin recording the session, if permission was granted by the participant.

The interview will start off with two small questions regarding the age and gender of the participants child, in order to account for possible bias if it is suspected that there exists one. After that the main part of the feedback session begins with the main questions about the three concepts [appendix A.9], where ever concept is treated equally and with the same base questions. The topics of these main questions were the good and bad aspects of the concept and the overall judgement per concept. It is possible to ask additional questions to make sure that the opinion of the participant is clear, as a semi-structured interview is chosen for this research. Every concept will first be presented to the participant and questions will be asked before moving on to the next concept, to enable undivided concentration on the specific concept. The researcher will present the concepts in different order between subjects by showing the participant visualisations such as 3D-models and interface mock-ups, whilst elaborating on the description of that concept. The questions that are asked provoke the participant to offer their thoughts and perspectives, which are desirable when choosing between these concepts.

After the three concepts are presented and the participant had his/her chance to elaborate on their opinions, the feedback session will diverge towards the concluding part. In this part of the research the participants will be asked to rank the concepts from best to worst, as this delivers a neat insight on their perspective. These ranking will, together with the argumentation behind the concepts, then be used to make a final decision as to which concept will be worked out into a prototype. When the researcher finished all the desired questions the participant will receive the possibility to ask additional questions or give remarks to make sure that he/she is satisfied. The researcher will then stop recording and have a small finishing conversation with the participant, after thanking the participant the research is over and the video connection will be ended. The recordings will be destroyed after the required information is distilled from them, the participants have up to 72-hours to draw themselves back from the research which means that every part of their feedback session will be deleted immediately.

4.6 Choosing final concept

In order to close the loop of the ideation process a final concept should be chosen, which marks the start of the specification phase. The opinions of the experts and potential end-users are summarized in a spreadsheet [Appendix A.13] to give a clear overview, percentages are added to get a grasp on the amount of negative and positive arguments per concept. However, the content of the argumentation combined with the best/worst chosen concept weighs the most when determining which concept was perceived the best. One key factor that immediately pops up when looking at the gathered information is that the farming application was chosen as the best concept by all the participants, suggesting it being the best concept of the three. This does not mean that this assumption is directly valid, further analysis of the argumentation is still needed to make a well-grounded decision.

To further examine the argumentation of the professionals and the potential end-users, the arguments are dived into three main groups: positive arguments, neutral arguments and negative arguments. Since it is possible that an argument is neither positive or negative, a neutral section was added. A remark is considered neutral when it can be considered either positive or negative regarding the interpretation. For example: 'when a participant comes with new ideas for a concept it can be interpretated either positive or negative. It is positive that the user believes in the concept and want to make it even better, but it is negative that they feel like something is missing.' The amounts of arguments in each group can then be calculated into percentages which will visualise the perception of each concept a little more. With the following numbers as a result:

Amount of positive/neutral/negative arguments	Positive = 5 Neutral = 3 Negatieve = 5	Positive = 4 Neutral = 1 Negative = 8	Positive = 8 Neutral = 5 Negative = 1
Ratio between Positive and Negative	38,5% positive, 38,5% negative	30,7% positive, 61,5% negative	57,1% positive, 7,14% negative
	Concept 1 - Thermometer	Concept 2 - Interactive Plate	Concept 3 - Farming game App

Figure 4.6: overview of the percentual relation between positive and negative remarks, where natural remarks were also counting to the percentage but not taken into account when analysing.

The results show that the "Farming game app" had the best ratio between positive and negative arguments, which is in line with the earlier assumption based on the most favourite concept. The farming app concept also has the most neutral comments, as the participants had a lot of new ideas that they wanted to add. The only negative remark that was given was the fact that more features were desired in order to make the concept more effective in the eyes of the participants. Another interesting founding was that the participants found that the 3rd concept was most suitable for the target group of children from 8 -12 years old, whilst the other concepts were deemed more suitable for either younger (concept 2) or older (concept 1) age groups.

When taking all the arguments [Appendix A.13], favourites and percentages into account it could be assumed that the 3rd concept, which is the farming game application, shows the most potential. This does not mean the other concepts are of a bad nature but a decision has to be made in the context of this research, which goes towards the 3rd concept. This also means that the ideation phase ends and the specification phase starts. With the newly gathered remarks, the concept can be polished into a final fully specified concept.

5. Specification Phase

Now that one of the concepts is chosen, it is time to enter a specification phase that is needed in order to enter the realisation phase. The goal of this phase is to further define the concept of the “farming game app” into a full-fledged concept that will serve as the template for the final prototype, specifying every necessary part. The concept can still change accordingly during the realisation phase, but specifying beforehand will greatly improve the quality of the end result. The specification phase will start off with the definition of requirements by making use of scenarios and specification of intended use. Afterwards the features that need to be present will be further specified as well as the game element.

5.1 Requirements for the concept

In order to make sure that the prototype is up to expectations requirements need to be set before specifying. These requirements can then be used to further define the features and other specifications, as they focus on complying with these requirements. In order to define the specific requirements, the intended experience and moment of using is further defined with support of a scenario, which was made in order to find possible gaps and key features. The scenario is as specific as possible and in focussed around an entirely imaginary person. These elaborations are used to come up with the functional and non-functional requirements for the prototype and will be tested during user-testing.

5.1.1 Scenario (Jens)

Jens is a 9-year-old boy who lives with his parents in a smaller village in the east of the Netherlands. Jens has Autism Spectrum Disorder and experiences average symptoms such as being easily distracted by unknown stimulus. In addition to this he is unable to consume vegetables because he gets a sensory overload when he sees, smells or tastes vegetables. These sensory overloads translate into gagging and feeling nauseous, and make trying vegetables a very frightening experience. His parents do not know how they can effectively help Jens to eat more vegetables and have asked Forza for help. Forza is able to help them nicely but they cannot be present every day, something supporting is needed when the caretakers from Forza are unavailable.

To support the parent and child when the caretaker from Forza is absent, an application was introduced to try and tackle the problem. The application is a little game that runs on the iPad of Jens, which is something that he seems to enjoy. Jens plays a lot of games on his iPad, so this is no novel territory for him which makes him feel more comfortable. The game is played after dinnertime so Jens can concentrate on his food, which is enjoyable for the parents as this does not make it harder for them to keep Jens an active member of the family during dinnertime. The parents weigh the food before and after dinnertime to determine how much coins Jens should receive, which takes a little time. Jens can then play for 30 minutes on his iPad, which he always does, and interact with foods and learns some facts about them. Jens really enjoys that dinnertime becomes more playful and that he can get a reward every day. What Jens likes the most is that he can use the coins he earned to eventually buy the best furniture for his shed, so he can show the shed to his peers. Even though it still is very hard to eat vegetables, Jens feels more motivated to try and interact with his vegetables so that he can get more rewards and further decorate his shed.

5.1.2 When and how to use

The application will be used after the preferred eating moment, not before or during the eating moment. This enables the application to serve as a rewarding experience, even if the interactions during the eating moment are not satisfactory. It could be possible to use this concept during the eating moment, rewarding the player with coins with every interaction, which might empower them motivational effect. The problem here is however that the child will then be distracted from the eating progress and using a phone/tablet during dinnertime is often not desirable. Children might not want to eat without the application after an amount of time, which could result in additional friction between child and parent. It is therefore safer to make use of a moment after dinnertime, as this creates the possibility of rewarding coins based on interactions with food and does not interfere with eating moments itself.

The child will receive a specific amount of playing minutes per day, 30 minutes. This could however be expanded by the parents if more eating moments are supported by the application. This limitation is to make sure that the child does not get too addicted to the game, which is a serious problem for children with autism [48].

5.1.3 Personal experience

One of the goals of this application is to make it as personal as possible, to try and empower the effectiveness of the support it can deliver. It is important that the parents and professionals determine what types of interactions need to take place in order to get specific amounts of coins as a reward. One of the most troubling aspects of this project is that the user group is very diverse, which makes it hard to create an application that will serve as support for most of these users. Some children only consume pureed foods while others only have trouble eating vegetables. By enabling the parents to make a plan for the personal eating behaviour of their child, the app can become more effective for a broader audience.

The parents need to be guided in determining the number of coins they reward for each eating moment. This process will likely be supported by the caretakers of Forza in combination with a pre-written manual. This manual will contain information about the minimal and maximum number of coins that should be rewarded, together with examples of how it could be done in the form of multiple scenarios.

5.1.4 Requirements for prototype (functional and non-functional)

A section for the parents exists to fill in details about food consumption (system requirement)
The parent should be able to fill in the details on food consumption (functional)

- This should take less than 2 minutes (non-functional)

The child should not be able to access the parent section (functional)

- The parent should be able to access with ease. (non-functional)

The child should enjoy the interaction (non-functional)

The child should feel motivated by the application (non-functional)

The child should gain more familiarity with foods(functional)

- The child should interact at least one type of food each time he/she plays (non-functional)

The prototype should not create friction with one of the following characteristics of the child: (functional)

- Concentration problems
- Sensory overloads
- Impairments (linguistic/intelligence)
- Repetitive behaviours

All the buttons should lead to their designated direction (functional)

- This should take a maximum of 3 seconds to load (non-functional)
- It should not be hard for the user to find the necessary button to go to a specific place. (non-functional)
- The user should not want to ask for help from peers. (non-functional)

The application includes three different currencies (system requirement)
The user gathers the different currencies in the intended way. (functional)

- The right specific currency an amount of that currency is rewarded in every occasion (non-functional)
- The currencies cannot be obtained by using real-world money. (functional)

5.2 Specified features (need to incorporated)

There are some specific features that need to be incorporated into the application. These functions are further defined in this section and all need to be present in the final prototype (with exception of the future additions).

5.2.1 Interacting with foods and the farmer

Inside the application, the child will interact with different types of food. The farmer will then tell the child more about that specific food. The famer gives the following information about the foods: origin (where/how does it grow), flavour, why he likes the food and why you should eat it. This will give an educational impact that will not only teach the child something but will also increase the familiarity that the child has with the types of food. Increasing the familiarity is proven to increase the probability of the child trying to interact with that specific type of food, so it is key to incorporate foods that the child will interact with [5].

The target group of children with autism and eating problems is very diverse. Every child has its own foods that are rejected and has its own ways of coping with these rejections, making it very hard to make a grounded choice of foods incorporated in the app. The rejection of foods often has a 'pattern' as stated by one of the experts [49] during an interview. Some children only eat red foods while others do not eat foods that have a 'slimy' texture. The most important characteristics that define most children's eating patterns are: color, taste and texture. To try and make sure most children have a balanced number of foods that they know and that they do not know, the app will include a large variety of foods. For example: A hard sweet red apple; a red juicy sweet/sour tomato; a study sweet orange carrot; slimy savoury green spinach. Notice that these all have some differentiating properties; some children might like apples and tomatoes but no spinach and carrots and vice versa. The goal of incorporating many different properties of foods is to make sure that a wide variety can be familiarized with foods that they need to interact with.

The prototype will contain the following foods:

1. Carrot (Orange, sweet, hard, vegetable)
2. Apple (Red, sweet, hard, fruit)
3. Broccoli (green, savoury, soft, vegetable)

By starting off with a smaller number of vegetables it becomes feasible to fully work out the prototype, for the end product more need to be added for higher effectiveness. The end-product could even include a possibility for parents to choose the vegetables that are included in the app.

Example of what the farmer could say about a carrot:
"I see that you have grown some fresh carrots, I love those! They grow all around the world and have a nice sweet taste to them, I love to take them as a little snack. They help you to make sure that you will not get ill and stay strong."

"Ik zie dat je een paar verse wortels hebt laten groeien, ik houd van wortels! Ze groeien over de hele wereld en zijn zoet van smaak, ik eet ze graag als tussendoortje. Ze helpen je zelfs om sterk en gezond te blijven."

5.2.2 Planting seeds

The game is mainly focussed around planting seeds and cultivating them until they are fully grown vegetables. When the vegetables are complete, the farmer will not only give some additional information about them but will also give a reward in the form of coins. These coins are different from the ones that the parent reward, more about the currency system can be found further in this document. The plant will grow through different visual phases that each project a step of 20% towards the end result of that vegetable. All vegetables have different rewards and growing times which are connected to their value in the store. Some of the seeds will be more expensive and need a specific level requirement, but will give a more lucrative reward. In the beginning the player will only have one field where six seeds can be planted simultaneously, but with further progression more fields can be unlocked.

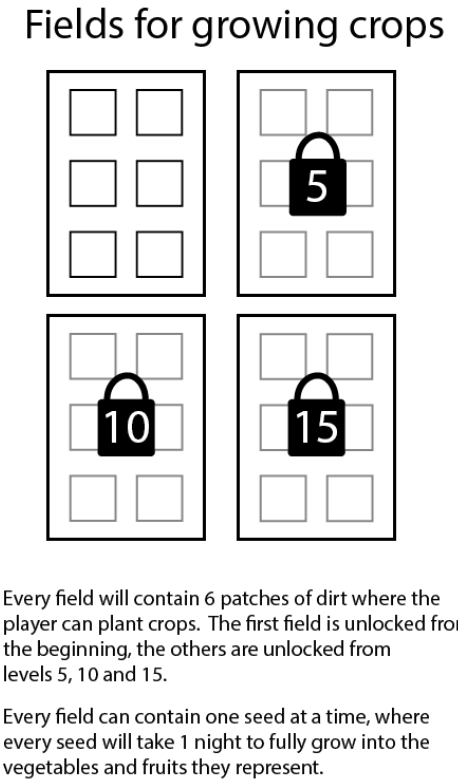


Figure 5.1: illustration of the four fields in which the player can plant seeds. The fields will be entirely decorated in the final version of the product. [Appendix A.14]

5.2.3 Subsection for parents

There will be a specific section inside the app that will only be accessible by the parents. In this section the parents will be able to perform specific actions. This subsection will be locked through the use of a 4-digit pin code that is set by the parents. These are: rewarding coins; filling in behaviour of child during dinnertime; view at statistics based on the gathered data.

After dinner (or any another eating moment when necessary) the parent will reward the child with in-game coins that can be used to buy seeds and upgrade specific assets such as buildings. The number of coins that the child receives for specific actions will be defined in a manual that will be available digitally as a pdf in the environment of the parents. Forza employees will also be able to access the parental environment of the app, but only on the specific electronical device that the application runs on. This manual will act as a guideline to determine the rewards values for specific interactions with food, but the parents and Forza employees will have to actually determine personal values. This makes the app more personal and, if done correctly, more effective.

After each eating moment the parent will also be able to fill in the number of interactions the child has performed with foods through the use of an ‘in-game’ questionnaire. The answers will then be stored locally to build up a database that can later be read by parent and Forza employee. The goal of gathering this information is to enable the parents and professionals to visualise the long-term data and see what the progression of the child is. With this information the strategy could be enforced or changed accordingly.

Questions that will be part of the data questionnaire:

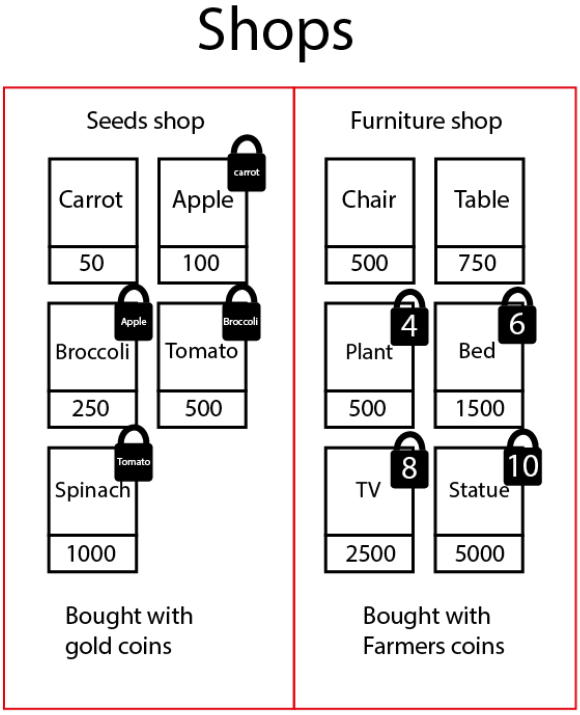
- How many ____ (touches, smells, licks, bites) did [name] have with his food? ____(#)
- What food did [name] try to interact with?
- Did friction occur in order to let him/her eat today? [1-10]
- What is the date?
- What is the time?
- Additional remarks?

5.2.4 Decorating your own shed

When the child has fully grown seeds into vegetables and fruits, a reward will be given in the form of coins. These coins are different from the ones that the parents give as a reward for the interactions with food during dinnertime, more about this can be found further in the document. The child can use these coins to make upgrades and buy new furniture that they can place in the shed. In the beginning the shed is completely empty and the farmer asks the child to decorate it to his/her own likings. Different sets of furniture will be added to the game to increase diversity and make sure that every child likes at least some of the furniture. The shed can also be upgraded so that it becomes bigger or gets a different background.

5.2.5 Shops

Two shops will be available in which the player is able to purchase new seeds and furniture. Figure 4.2 shows how these shops will be structured. More information about the currencies used in the shops and the experience point system can be found further in this chapter under ‘specification of economy’.



Some items in the furniture shop need to be unlocked wth certain amounts of experience points. Some seeds in the seed store are unlocked by fully growing other seeds into crops.

Figure 5.2: illustration of the two shops in which the player can buy seeds and decorations. The shops will be entirely decorated in the final version of the product. [Appendix A.15]

5.2.6 Future possibilities

The current prototype will include the features that are listed above but there will always be room for expansion. If the application will be worked out into a final product, more features could be added to make the app even more interesting and interactive. Examples of additions could be: having animals that create foods in order to extend to selection of origins of food; minigames to earn additional coins to extend the playability; and a goal-setting system for motivational purposes. Due to time limitations and effectiveness of research, the prototype will not contain these features as they do not represent the ‘core’ of the concept.

5.3 The game economy

The application will include three different ‘currencies’ that together form the economy of the game, these three currencies are:

1. Gold coins, these are rewarded by the parents after dinnertime and can be used to buy new seeds to plant on the field. In addition to this they could be used to make functional and cosmetic upgrades to the field. The gold coins can only be acquired through the parent’s subsection of the application.
2. Farmers Coins, these coins can only be acquired through the farmer who buys the fully grown crops from the player. With these coins the player can either choose to make functional upgrades to the farm or invest in the shed. These coins give the player the ability to buy furniture and backgrounds for the shed.
3. Experience points, these might be slightly different from the other currencies but are still needed to gains access to specific upgrades and items. Some upgrades, seeds and pieces of furniture need to be unlocked before they can be bought. This way the player does not progress too fast and gets the satisfaction of progression as he/she levels up. The experience points are rewarded after dinnertime as an additional reward and after growing crops, with growing crops being the most lucrative. Experience points rewarded from dinnertime are static and therefore do not differentiate according to prestation, which enables the child to progress through the game smoother for a more enjoyable experience.

As stated by Jesse Schell [50] in ‘the art of game design’ it is of great importance to build a balanced economy inside your game. A player should not progress to fast through the effect of a badly balanced economy, but too slow would also be demotivating. The three different valutas listed above are meant to make sure that the progression runs smoothly, by making sure that specific tasks are performed. The way that the player is supposed to make its way through the game is visualised in figure 5.3.

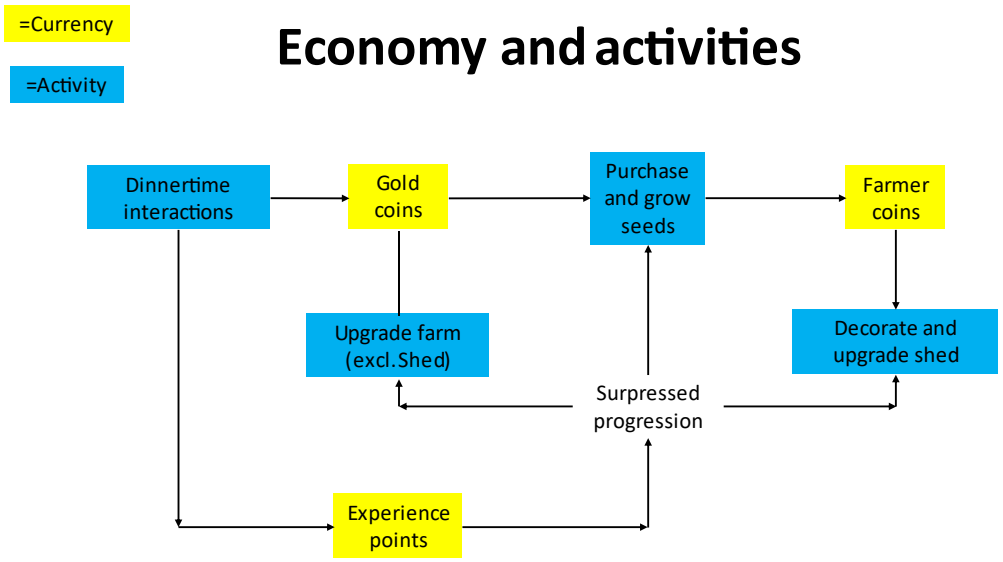


Figure 5.3: an overview of the intended way that the currencies and activities are related to one another. The user should gather gold coins from dinnertime interactions, which can be used to purchase and grow seeds. These grown seeds can then be used to gather farmer coins which are necessary to purchase decorations for the shed. Experience points are another currency that can be used to unlock additional options in the shops.

The end goal of the application is to decorate your own shed with fun and playful furniture, some sort of trophy room. But in order to get furniture for the shed ‘Farmer coins’ are needed, which are only distributed by the farmer. The farmer only rewards these coins when a player has fully grown crops to sell, which originate from the seeds. These seeds can be purchased in the store with ‘Gold coins’ and those can only be received from the parents, in relation with the dinnertime interactions. Additionally, the progression is suppressed by the experience points if the received too many coins for any reason, which will unlock specific items and upgrades at specific levels. First of all, this structure makes sure that the eating sessions are the core as all the activities become possible only after receiving the gold coins (linked to dinnertime) from the parents. To make sure there is not too much pressure on dinnertime activities the children will still get a reasonable amount of gold coins after, even if nothing is eaten.

The structure described above will also make sure that the player performs all the steps before getting furniture as the ultimate reward. If for example the furniture could be bought with the same valuta as seeds, growing crops would be useless and would be skipped. When that process is skipped the farmer does not get the chance to educate the player about the foods, losing an important step in the process of increasing familiarity.

5.3.1 Economy specified

As a proof of concept, for each eating moment the quantity of food that is presented before the player is divided into an imaginary 10 ‘pieces. Every 1/10th piece of food will count for a reward, where in the beginning 1/10th is worth 100 gold coins. When the player progresses over time, it will earn more coins per 1/10th. Participation is worth 100 coins to ensure a small motivational reward, this reward is voided after half of the portion is interacted with. This progression can be seen in figure 5.4.

Level	**Coins earned per 1/10th**
1	100
2	110
3	120
4	130
5	140
6	150
7	160
8	170
9	180
10	200 (10-coin bonus)

Figure 5.4: Rewarding coins per level

This trend will continue through the levels indefinitely, until the maximum level is reached. The maximum level for the prototype will likely be 10. This essentially means that when the player gains 10 new levels the number of coins potentially earned per eating moment doubles. This is done to make sure that the player will be able to progressively buy more expensive seeds and pieces of furniture. The amounts of experience points gathered from growing seeds can be found in figure 5.5, the number of points needed to progress to higher levels is depicted in figure 5.6.

Name of seed	Gold coins (price)	Farmer coins (income)	Profit in %	XP reward
Carrot	50	57/58	15%	50
Apple	100	117/118	17,5%	100
Broccoli	250	300	20%	250
Tomato	500	612/613	22,5%	500
Spinach	1000	1250	25%	1000

Figure 5.5: economy table for different types of seeds.

As you can see in figure 5.5 it will be worth to progress to different seeds and gain more profit for them, making sure that the player uses different seeds instead of just one. Some seeds have two different amounts of farmer coins as reward that will each occur with a chance of 50%, which is due to the rounding off of numbers.

Level	Xp needed	Level	Xp needed
1	0	11	6000
2	500	12	7000
3	1000	13	8000
4	1500	14	9000
5	2000	15	10 000
6	2500	16	11 000
7	3000	17	12 000
8	3500	18	13 000
9	4000	19	14 000
10	5000	20	15 000

Figure 5.6: table with experience points needed in order to progress to next level. (amount is not resetted when player progresses to next level)

6. Realisation

By making use of the now specified concept, a prototype could be realized during the realisation phase. During this phase the fully functional prototype was created by the researcher and continuously evaluated together with peers and in the end with experts in order to define the possible gaps within the quality of the prototype. It is important to define these gaps during this phase of the project as they can be fixed and would therefore not pose any obstruction during the evaluation of the prototype and its concept. The majority of the prototype was created within the space of two different pieces of software:

- **Adobe illustrator**
  This tool was used in order to create all the images that are used inside the prototype in order to provide visual consistency. The quality of the images was not of the highest priority but the imagery needed to be up to standard. The images needed to resemble a possible end-product and improve the overall usability of the prototype. For example, the shops on the main screen of the prototype needed to resemble a shop in order to enable the user to recognize it as a shop.
- **Axure RP 9**
  This tool was used in order to create the entire prototype and its functionalities. By using the possibilities for conditional logic, variables and animations it was possible to create an entirely functional prototype. The cloud functions of Axure were used in order to save and test the prototype during the evaluation phase of the project.

6.1 Feedback from professionals

During the final stages of the realisation phase the prototype in its current state was presented to a set of 6 experts who tried to make use of the functionalities within prototype. This feedback moment was incorporated into the final parts of the realisation phase in order to find possible gaps that could be filled in order to engage in a more effective evaluation with potential end-users. The prototype was not completely finished during this feedback moment which unfortunately decreased the number of gaps that could be discovered. Nonetheless there are a few comments that the professionals made that identified some points for improvement that were made before the valuation of the prototype.

The most important gaps that were identified by the experts and consequently filled were based on the usability of the application. There were a few questions and comments about the specific lay-out of the application which made it unclear for the experts how to navigate the application. These comments were used to improve upon the prototype and make it more understandable to use. In accordance with this a general introduction was added into the application in order to further elaborate on the possibilities and goals within the game, by showing the user around before they were set free to explore. Lastly a set of bugs were identified as the experts navigated through the prototype, which were also fixed before ending the realisation phase.

6.2 The final prototype

The final version of the prototype contained all the main features that needed to be present, as stated in the specification phase of this project. The prototype was fully functional and accessible through the cloud functionalities of Axure RP 9. The figures below show the different features that are incorporated into the final prototype, as well as the artwork created in Adobe Illustrator. A link to the fully functional prototype can be found here: https://r4xsb7.axshare.com/

6.2.1 Introduction

Figure 6.1: A few snapshots from the introduction to the prototype. Note that this does not represent the entirety of the introduction.

6.2.2 Parental section

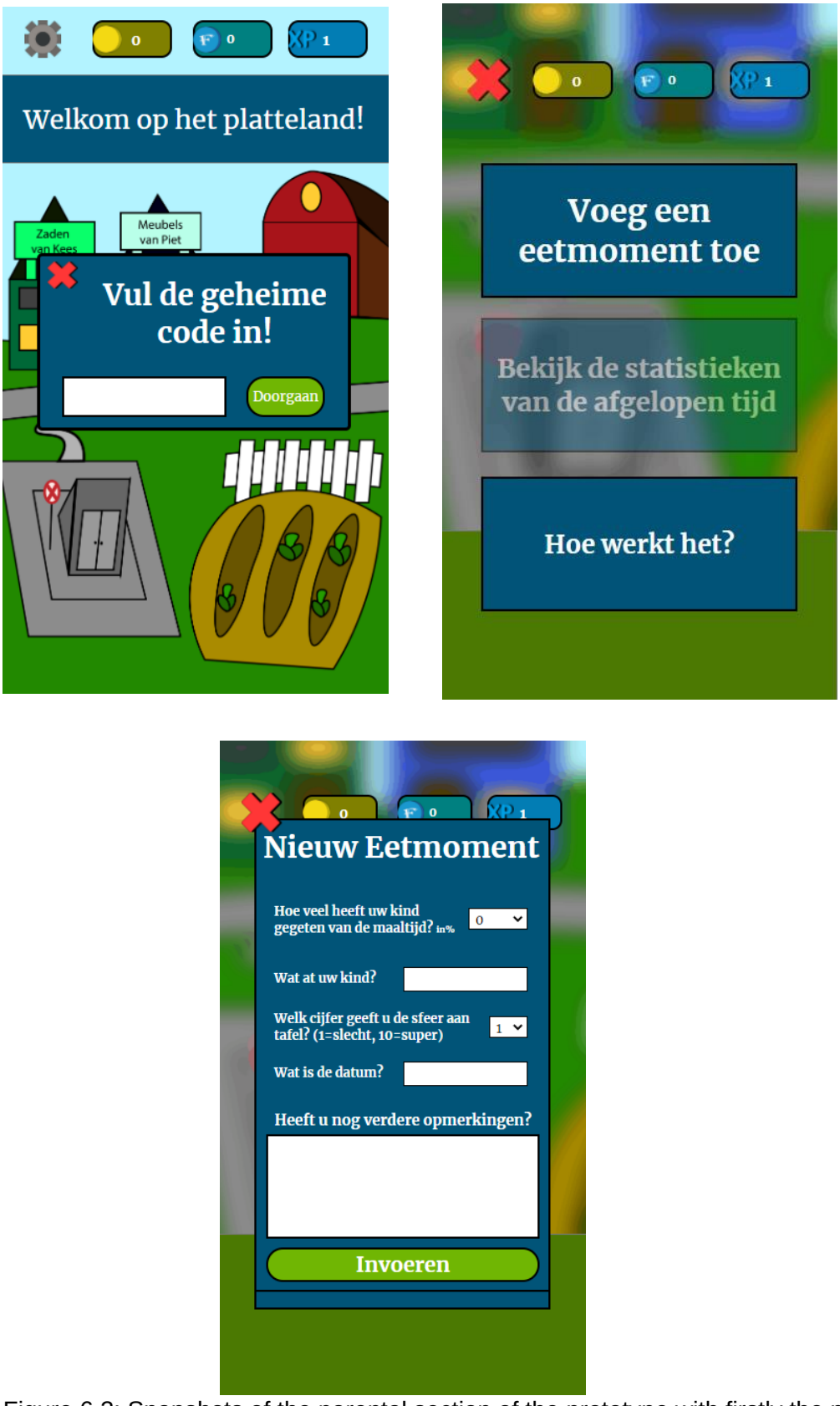


Figure 6.2: Snapshots of the parental section of the prototype with firstly the password pop-up on the main screen. Followed by the interface of the parental section and the pop-up screen to add an eating moment.

6.2.3 Shops + currency

Figure 6.3: Snapshot of the interface that shows the number of different coins that the user has, the currency system is fully functional.

Figure 6.4: Snapshots of the two different stores. One where the user can buy seeds and another where the user can by the shed and decorations for the shed.

6.2.4 Field & sell screen

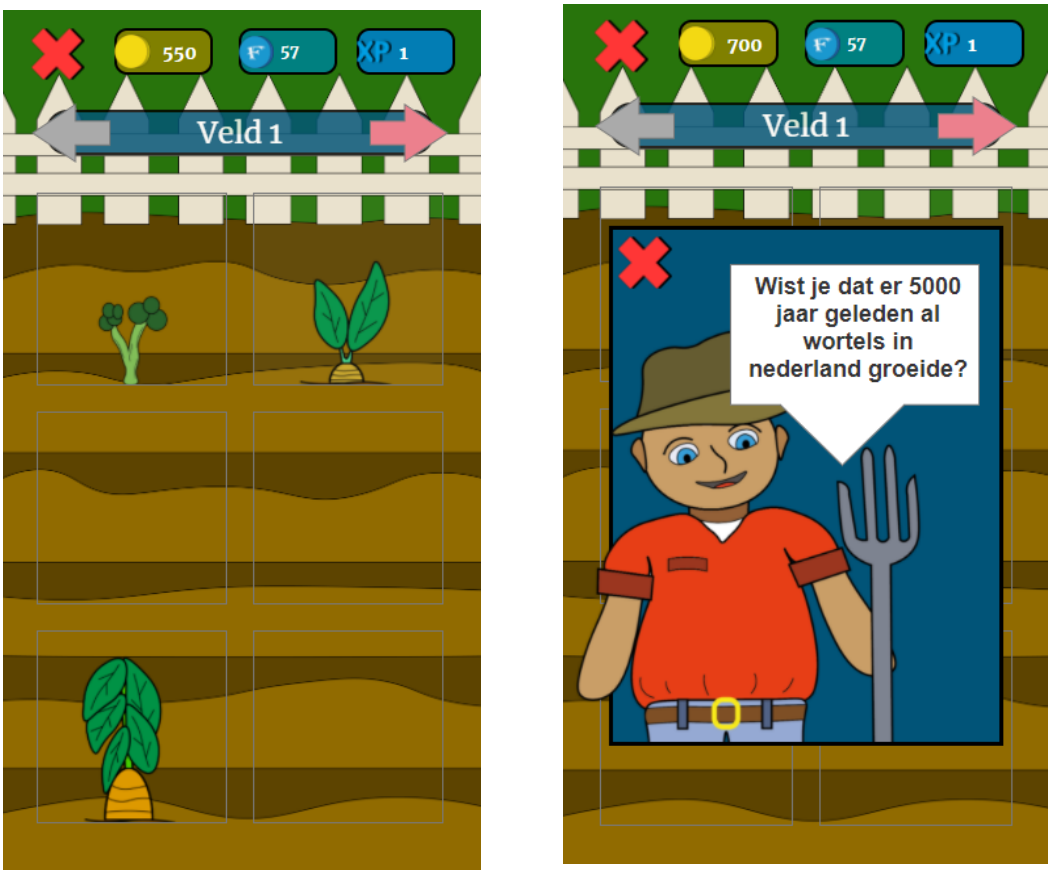


Figure 6.5: Snapshots of: on the left the field where the seeds can be planted and grown with a few seeds planted in it. And on the right the pop-up screen in which the user can sell crops to the farmer for coins and a little fact about that piece of food.

7. Evaluation

The prototype that was developed and created during the previous phases of this project was tested during the evaluation phase of the project. A study took place with various potential end-users within the target group and if further described an analysed in this chapter. The research question that was linked to this specific study was: “To what extent could the current prototype serve to support parent and child in their current situation?”

7.1 Procedure of the research

The study took place during the 4th week of January 2021. The goal of this study is to evaluate the value that the current prototype can offer as opposed to the goal of the project. The goal of the project is: “to support both parent and child in the struggle of eating problems and autism spectrum disorder. During these studies the researcher will user-test the prototype with children and their parents inside the target group. The age of the children within the target group is 8-12 years old, but due to limitations regarding the size of the target group and COVID-19 measurements younger participants (up until 6 years) will be allowed. The recruiting of participants will be handled by employees of Forza, who have specific insight on the medical status of the children. This is useful as the target group of children have autism spectrum disorder.

During the sessions both audio and video will be recorded in order to make full use of the information that can be gathered from the session. During the first part of the research in which the participants interact with the prototype, the screen and faces of the participants will be recorded. During the second part of the research solely the faces of the participants will be recorded. Recording the session enable the researcher to give full attention to the study as the researcher is not busy writing every statement down. The participants will be informed upfront about the recordings, and need to give their consent before starting the recording. The recordings will be converted into written down data using the statements of the participants, whilst making sure the data is anonymous. After the researcher is convinced that all data has been extracted, the recordings will immediately be destroyed permanently.

The goal of this study is to evaluate the current prototype and concept by analysing the qualitative data gathered from the study. The research will consist of two parts: user-testing the prototype & an interview regarding the interaction with the prototype. The prototype is created inside Axure RP 9 software and will be tested by making use of the cloud-functions of Axure RP, which offers the option of remote user-testing on a webpage which the participant can open. Both parent and child will receive a set of goals to achieve and will be monitored during this process, but not guide by the researcher unless the necessity to do so arises. The second part of the research consists of a semi-structured interview and will be conducted after the interaction with the prototype has been concluded. The interview will revolve around the perception of the participant regarding the prototype and its interaction and is semi-structured to deliver some leeway for the participants to fully express their opinions. In addition to the questions that solely revolve around the prototype, some questions will revolve around the expected relation between autism spectrum disorder, eating problems and the prototype itself. The questions [A.16], information brochure [A.17] and consent form [A.18] can be found in the appendix section.

7.1.1 Part 1: interaction with the prototype

Goal: to get a better understanding of the usability of the prototype

The participant will receive a set of goals and is asked to think aloud whilst trying to achieve these goals. In order to make sure that the participant does not get overwhelmed, the researcher will take two specific measures. Firstly, the researcher will only give one task at a time so that the goal is clear at any time. Secondly, the researcher will not ask questions during the interaction whilst the participant is allowed to ask questions if they want to. This way the participant can always express themselves as they are asked to think out loud, whilst the researcher will not distract the participant. In addition to this the researcher will not lend any guidance unless this is deemed necessary by one of the parties present, as this would skew the results of the user-experience.

What are the specific goals that the user receives?

These goals will be stated in Dutch during the research due to the nationality and age of the participants.

- Can enter a new ‘eating moment’ in the parent section? [PARENT]
- Can you tell me how many gold coins you currently have? [CHILD]
- Can you buy some carrot seeds in the seed shop? [CHILD]
- Can you plant those seeds in the field? [CHILD]
- Can you fully grow these seeds and sell them to the farmer? [CHILD]
- How many farmer coins do you have now? [CHILD]
- Would you like to buy, plant, grow and sell some broccoli seeds? [CHILD]
- How many Farmer coins do you have now? [CHILD]
- Can you buy the shed, and take a look inside? [CHILD]

Note that some of the goals get progressively harder over time. For example: the process of growing carrot seeds is explained in different small steps, whilst this does not uphold for the process of growing broccoli. This is done to test the learnability of the interaction; can the user perform the specific steps without further guidance after performing them one time prior?

During the interaction the researcher will focus on the way that the user interacts with the application, taking notes (from recordings) of their behaviour. The researcher will focus on:

- Verbal and non-verbal expressions of emotion, what emotions does the user emit?
- Linguistic expressions, what does the user say?
- Behaviour, how does the user navigate through the application?
- Timing, how long does the user have to think about taking steps towards the goal?
- System flaws, does the prototype work the way it was intended?

Note that the researcher is not a professional regarding emotional expressions, especially not in combination with autistic children. The researcher will do his best effort to recognize specific expressions that contain useful information, but might miss some finer details.

7.1.2 Part 2: semi-structured interview

Goal: to get a better understanding of the perception of the prototype

The questions were stated in Dutch during the research due to the nationality and age of the participants. The answers to the questions were anonymously gathered in a spreadsheet together with the answers of all other participants. The researcher then performed a 'thematic analysis' [51] whilst using coding techniques in order to find similarities and differences between the different participants. The questions can be found in the appendix section: Appendix A.15

7.2 Analysis the results

The goal is to answer the research question specific to this study as stated earlier in the introduction of this chapter. In order to be able to come to strong conclusions it is important to prepare the information that is available inside the recordings. The recordings will first be transcribed in order to allow the researcher to get more insight in the information. After the transcribed versions are available the researcher will annotate the documents and familiarize himself to be able to assign specific codes to specific parts of the text. Once the researcher is convinced that the codes are satisfactory the resulting themes can be analysed in order to come to further conclusions.

7.2.1 Transcribing & familiarity

The first step into making sense of the data available is to transcribe, and therefore write down, the statements that are made during the study. The goal is to come up with a broad overview of what has been said, in the words that the participant has used. If the entire conversation is written down it becomes possible to dive deeper into the meanings of what has been said, even below the surface of the information. Where the surface of the information is what has literally been said, with all the reasoning and opinions below that surface.

By transcribing the entire study the information becomes more visible, but the researcher will also gain familiarity with the available information. The researcher might have conducted the study and have already heard what has been said, but that does not mean there is no more to learn. By enabling the researcher to indulge and familiarize the information available, the process of defining themes and learning points becomes possible. The next step of increasing the familiarity within the transcribing's is to annotate them, to find the main subjects within the text.

7.2.2 Defining themes (coding)

Now that annotated versions of the literal text are available, it becomes possible to further define the themes that are present inside the information gathered during the research. Using the statements that were annotated with different themes and key-words, the major themes can be defined. It is important to understand that this is an iterative process of defining themes, then redefining them until a satisfactory result is achieved. The researcher should feel comfortable with the declared themes and should be able to create a narrative from it in order to complete an effective analysis.

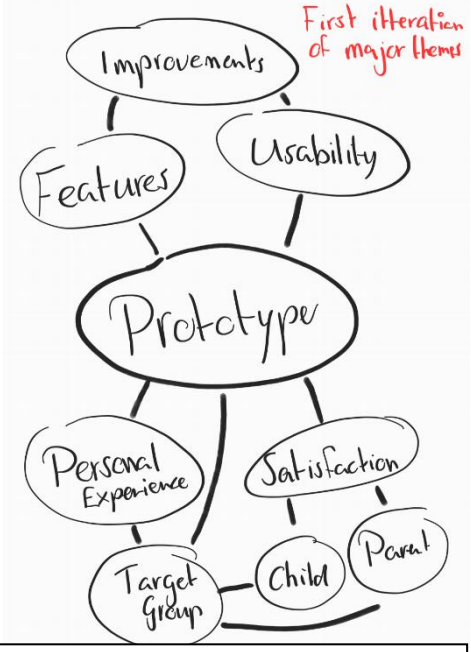


Figure 7.1: A mind map that was created in order to illustrate the first possible codes.

The process of defining codes was initiated with the researcher defining topics of interest. This list is based on the familiarity that the researcher has created inside his head, and will form the basis of the iterative process of defining major themes within the data available. These themes that form the basis of the coding process can be seen in figure 7.1. The different themes are then further defined in order to find out which themes are actually important and which should be merged inside other themes. The researcher will intensively use the annotated transcribing to keep on track with the actual data and find possible new themes, contradictions or similarities. Note that one specific comment that is given by the participant can serve as an argument within multiple themes, as the themes might be closely related to one another.

The final themes that were found as a result of this process are:

- Usability
- Parental satisfaction
- Child's satisfaction

Reality check – Requirements from specification

During the specification phase a few prototype requirements were set up, which were created in order to determine what standards the prototype should be held up against. As a small reality check the major themes can be compared to the themes of the requirements. When taking a closer look at the themes of the specific questions it can be concluded that they are very similar to the final themes, as they also revolve around usability and overall satisfaction. This can be interpreted such as that the intended standards were researched, and therefore the current themes are assumed to be suitable and effective.

7.3 Analysis

7.3.1 Usability

The usability was mostly tested during the first part of the research, where the participants were asked to complete specific goals with the prototype. In the transcribing the most important findings regarding the reactions from the participants were written down and annotated with key-words that describe the nature of the result. During all studies, the child had no difficulties with the navigation trough the prototype. An interesting distinction between the children could be seen between the nature of their enthusiasm. Two of the children that participated in the research showed much enthusiasm and started clicking around before any goals were given to them, whilst the other two children were more hesitant and awaited their goals. Interestingly enough, there was no differentiation regarding the ability to understand which buttons need to be pressed between the different levels of enthusiasm. Once the children that were more hesitant received a goal they also started clicking around and easily found the buttons that they needed to press, which suggests that the current prototype is intuitive to use for children within the target group. This relation also holds when focussing on the goals on a higher level, where all children were able to find the meaning of their goals with ease. When asking the children how they felt about navigating through the prototype they all answered that it was very doable and understandable. However, the more enthusiastic children were more eager to add that it might be interesting to make the interaction more complex.

In addition to understanding the interface and interaction of the prototype, it is interesting to get a better insight about the level of understanding regarding the basic concepts of the prototype. For example, it is important that the child is able to independently understand the language, currency system and goals that they are working with. When focussing on the linguistic aspect of understanding what is happening on screen, there are some differences between the subjects. Two of the children needed help from their parent when reading the introductory text, which was meant for the child to read. The other two children did not struggle with the text and were able to read and understand the text at an adequate pace. This does not stand in relation to the enthusiasm of the children, as one of the more enthusiastic children needed help from his parent. This suggests that the language might need to become a little easier to read and therefore more suitable for the target group.

Overall, the children had a satisfactory experience, which was also expressed by the positive reactions to the questions regarding the way that they enjoyed the interaction with the prototype. There are however some areas in which the product can become more usable for a larger group of children with on the one side children that need more help understanding the language and on the other hand children that require a more complex thinking experience.

7.3.2 Parental satisfaction

As the parents of the children are also one of the most important stakeholders that need to be satisfied, it is important to weigh in on their values and opinions. During the first part of the user test where mainly the child was performing the tasks, the parent also received one task. This task lays at the origin of the entire concept and therefore needs to be understood and accepted. The parents were asked to fill in a ‘new dinnertime moment’ which will award the child with gold coins. When the parents were asked what they thought about this causal relation, an overall positive reaction was given. Something that made the perception of the parents very positive is the way that the child is essentially rewarded for good eating, but not punished for not eating. All the parents were additionally asked why this would not be an

equal reward as opposed to typical rewards such as giving a desert or later bedtime. This question was always answered with the same argumentation: a simple reward such as giving a desert is not something that is interesting to a child, something needs to trigger them and an app or game is always able to do so. Two parents even added that children with autism need to have insight on what they can get rewarded with, which is in their opinion possible with this application.

Another thing that arose when talking to the parents was the amount of value that they invest in keeping peace with their child. None of the parents was willing to pressure or torture their child, as they did not deem it worthy or effective. Instead, they explained, their eye was fixed on the individual motivation of their child. They kept the initiative with the child and would reward them accordingly, but would not make a fuss when the child would not eat," I *do not want to punish my child with anything because he already tries so hard."* [52]. This is one of the main reasons that the parents liked the prototype and the concept behind it, as it was all about the motivation of the child to progress through the game: "*I like how this application gives a valuable reward for my child's motivation rather than punishing for bad eating behaviour"* [52]. However, none of the parents were able to determine whether their child would surely be motivated by the application, but some did cautiously predict that they probably would. Three of the parents were very happy with the idea of making use of an application whilst the other parent was more cautious with their response: "*You do not want to start a new addiction that could lead to new frictions, however applications always seem to motivate my child*" [52]. The three other parents added that an app is something that could really trigger a child, if the rewards remain interesting enough.

When asking whether the parent would try to make use of the application if it were available in the app-store all four parents responded positively. This question might however have created a certain bias in which the parents might have given a desirable answer rather than a critical one. Rather the questions could have been: "*What would you do if someone developed an application like this*?" By distancing the researcher from the concept, it would have been more reassuring that an honest answer was given rather than a desirable one. The results can be analysed with great caution nonetheless. The parents were willing to try something that in their eyes was very suitable for the likings of their child, and all other children with eating problems as two of the parents added: "*I do not think that you should focus too much on children with autism spectrum disorder, as more children could benefit from this application"* [52] *.*

Interestingly, all parents added that they were willing to try a large variety of new things which is something that they already do. Which is something that comes with a fair warning, as often new tactics do actually work but decrease in effectivity quicker than a new one arises: *"We try many strategies and most of them work for a little while, but then lose potential quite quickly"* [52]. One parent had only just started receiving help from Forza whilst another was already receiving help for several years but both elaborated that this is not a problem that is solved within a few weeks. For this reason, the parents were hungry for something that could potentially keep the attraction from their child for a long period of time. Because of this the largest point of feedback that was given by the parents was to 'add more to it' and 'keep it interesting for longer'. As one parent added: *"I like the idea of the application, but I think it would need more features in order to really make it work."* [52]. With three parents this remark was followed by an enthusiastic explosion of possible additions that could be suitable for their child, such as: farm animals, puzzles, history and customizable characters. All these features could potentially be added in order to increase the level of

complexity and number of possible activities, which could lengthen the potential time of interest.

Lastly all of the four parents thought that the application would be very suitable for children with autism spectrum disorder: “For children with autism spectrum disorder, it is important to have a good insight in what will happen and what the reward will be. In my opinion that is quite clear with this application” [52]. The application was easy to use and understandable, but two of the parents added that the language used might have been a little too difficult.

Overall, the parents did see a lot of potential in the current prototype and were very eager to ask about the future of the research, which suggests that they are satisfied with the concept of the current prototype. The parent sees how this could support them into motivating their child to try to eat more. They do however wish to see more features added in order to assure them that their child will keep its interest for a longer period of time. They understood the interactions and enthusiastically awarded the coins to their child, which sparked more enthusiasm with the children.

7.3.3 Child’s satisfaction

Most important of all the children should be satisfied with the prototype that is shown to them, as it is created purely for them. When letting the child interact with the prototype it was clear that all of them knew how to deal with an application, as was described in de the analysis of the usability. During the interaction some children were openly enthusiastic whilst others were a little more tranquil and awaiting. But even the more tranquil children showed moments of joy at different stages of the game. One of them showed more interest and joy in the planting of the seeds, whilst the other showed joy by openly reacting to the receival of a fact with a small joke to her parent. Lastly all the children showed a large deal of curiosity by exploring the possibilities of the application, and asking a lot of questions about more possibilities. When the child was exploring curiously it was clearly visible from happy expressions in their face and voice that they were enjoying themselves. Suggesting a satisfaction with the children that participated in the research.

When the children were asked whether they would try to eat more of the foods that they do not like they all answered that they certainly would. Whether this will hold true in a real-life situation could be argued, but they at least showed a positive reaction toward the concept of the prototype. The main reasons which gave them the idea that they would try more was that they would receive gold coins which would help them to uncover the mysteries that were hiding within the application. They clearly got very curious about the locked icons, what could lay behind that. In addition to that the idea of ‘gold coins’ suggestively triggered something with the children, as all of them spoke specifically about these gold coins and not the blue ones, which suggests that the choice of color and shape of currency can have a large impact.

When asked what should be added/improved two children came with a lot of ideas about customizability and more complexity where other children were satisfied with the current application. However, after the children that were completely satisfied were suggested some additions such as animals and more customisation, they immediately agreed with these ideas. What was interesting however was that the suggestions that the children made were heavily connected to their hobbies and likings, which can be seen as an example of the diversity within the target group. For example: the child that had large interest in horses suggested to add a stable with farm animals whereas the child who liked history wanted more fact about the different foods. It was clear that the children were mostly very positive

and not negative at all. But it was also clear that the current interaction was satisfactory, they were just not always able to look ahead to the next moment in which they still needed to stay interested and curious. It is however safe to assume that the core of the interaction sparks interest with the children, but the question on how to keep their attention remains unanswered. There were however some suggestions that were made such as adding more seeds, more animals, more customisation and treasures that could be added in their opinion.

When taking a closer look at the age, gender and situation of the children and compare that to the target group, one could see positive results. All of the children were within the age of the target group and seemed to react positively to the prototype. In addition to this all the children were dealing with eating problems, each in their own form and phase but that did not seem to have any effect on their perception of the prototype. Lastly not all the children were dealing with autism spectrum disorder which also did not give any clear differences, creating the assumption that both children with autism and without autism could benefit from this application. Mainly the older children were quicker in their gameplay and were more eager to give suggestions on what could be added, which could suggest that they would need more interactions to keep themselves invested in the application.

7.4 Conclusion of the analysis

Both parent and child show a very positive response to the prototype in the current state and would most definitely try to make use of the app if it were available. The app is intuitive to use for both parent and child and is mostly understandable for both parent and child. More time should be invested in making the experience more personal for both children that need more guidance with the text, and children that might want more complexity inside the interactions.

The prototype was perceived very well and all participant were satisfied with the concept they saw before them. They were able to see the potential that the application could have if it was worked out into a final product. Keeping the motivation of the child for a long period of time is shown to be the greatest piece of fear that arises when both parent and child are asked about their perception of the current prototype. There are currently not enough different interactions that take place, and the complexity of these interactions should be increased as well. The implemented features seem to work well for at least the first interaction, but do not yet account for further interactions. The assumption arises that it is most important to keep the child curious, and therefore presumably interested in receiving coins as a result of eating properly. Therefore, it would be interesting to gain more insight on what exactly sparks the most amount of curiosity for these children, and how long that curiosity would last. Making use of an application is a very good start in the eyes of the parents and children as this is familiar and ‘triggers’ the child. In addition to that the usage of ‘gold coins’ seems to be something to create a large investment for the child. But there are still improvements to be made with regard to the length and volume of the gameplay in order to make sure that a child will keep its motivation for longer periods of time.

8. Discussion

A great diversity of information was gathered in the context of this research, which should contribute towards the answer of the research question stated in the beginning of the research: “How to support children with autism spectrum disorder and their parents in better eating habits?” A background research and evaluation of a functional prototype have been used in order to generate findings that could contribute towards creating a concluding answer to this specific research question. In this chapter the various findings and possible comments are presented in order to define the possibilities for future research.

8.1 Discussion of current concept

The current concept that was created in the context of this project should comply with the wishes of the target group and introduce a novel supportive function towards better eating habits. In the beginning of the project it was found that the children currently receive support in the form of coaching, work-sheets and specific eating methods such as the ‘teaspoon method’ [6]. The client however noticed that the children were often not motivated by these methods, whilst often showing large interest in technology. During the State-of-the-Art review it was found that there are currently a few technologies available that slightly address (a part of) the current problem, and none that directly address is. During the analysis it was suggested that the current concept it able to address the specific situation and work towards its goal, whilst also suggestively reaching further than the target group towards children without autism spectrum disorder.

The study performed within the context of this project shows that the child is able to autonomously navigate the application and make their own choices, enabling the feel of having control over the situation. The child can decide whether he/she eats more ‘good’ foods in order to get more coins and therefore determine his/her own motivation to do so. This should contribute against the counterproductivity [5, 2] of pressuring the child to eat their foods, which is a pressure that the participating parents of the study were all against [52]. This does however come with the probability that the child decides not to cooperate and therefore not make usage of the concept which will then use its effectivity.

The effectiveness of the current concepts is not to be determined with the current results and information available. The study has shown positive results regarding user satisfaction and usability, but does not assure a sustainable source of motivation and better eating habits over time. The length of gameplay and possible duration of motivational pull were the greatest concern for the parents participating in the study, which marks the greatest gap for the current concept. In addition to that, certain biases might have been present inside the results of the study, which are elaborated further in this chapter. The children did show a lot of joy and enthusiastic behaviour during their interactions which could have positive effect to their perception of dinnertime activities, which could then lead to a lower degree of picky eating [5]. In addition to that the children were able to gain more familiarity with specific foods that are incorporated in the application which would rise the familiarity with these foods. The increased familiarity could then lead to higher willingness to try and eat that food, but the impact of this specific increase in familiarity is not known to be significant.

All together the current concept does show positive results and could suggestively contribute to support the current situation, with positive results in both perception and usability. The current concept could be a new addition to the current tools used and would help to provide support independently from Forza. However, the concept still has some major gaps, for example regarding length of gameplay and motivation. Lastly, the true impact and effectiveness is yet to be determined, for which further research is necessary.

8.2 Limitations to the research process

During the background research various different topics were explored in order to get a better understanding of the different aspects within the context of the research question. The background research was able to give an overview of the information available on these specific topics but could have gone deeper into the specific situation. The subtopics inside the background research are currently disconnected from one another and even though the information is useful and interesting, the connection in-between topics and to the current situation is often missing. In addition to that, the current findings merely provide a 'birds-eye view' of the target group. On one side this is useful as the target group has shown itself to be diverse during the conversations with parent and child during studies. By making use of an overview rather than a specific person could therefore help to reach a greater part of the target group. However, it could be possible to come up with more applicable findings by diving deeper into specific situations and specific users, rather than hovering over them. The current background research was sufficient in the context of this research as the main findings could be used to further define the concept and the prototype, but more specific research should be done to progress further within the development of the concept of the prototype.

During the ideation phase of the project the researcher created ideas himself and then gradually downgraded the number of ideas with the help of both experts and potential end-users. This was an effective means to swiftly come to a final concept, enabling the project to further progress. However, the ideation could have been more intertwined with the connection towards the experts and potential end-users. For example, the potential end-users could be asked about their ideas during the early stages of ideation whilst ideas are still generated. As was found during the study with potential end-users in the context of the ideation phase, the participants showed a great interest in delivering potential new ideas and features. By allowing the potential end-users during the earlier stages of ideation the not only get more involved in the project itself, but can also deliver new ideas and insight that are specific to their situation. It should not be forgotten that the potential end-users are in fact professionals within their current situation and might knowingly or unknowingly have great ideas. It should however be noted that the researcher should be constantly aware of potential biases, especially if the participants are included in multiple phases of the ideation or further project. A participant who actually came up with one of the ideas might be heavily biased towards favouring that specific idea during the second study where participants were asked to deliver their opinions regarding multiple concepts.

Throughout the project there were several possible biases that were recognized, which might have affected the results and conclusions that are drawn. The researcher has put a lot of effort in making sure that potential biases were avoided, but some have slipped through the remaining gaps created by the inexperience of the researcher. During the feedback session with experts in the context of the ideation phase the experts showed great interest in one of the concepts presented, but mostly neglected a great part of the other concepts. This was most likely due to the fact that the description of their favourite concept was more in-depth and complete than the descriptions other concepts, which made it harder to acquire concluding remarks from this feedback moment. The descriptions that were presented in a later study, in cooperation with potential end-users rather than experts, were presumably more balanced and showed similar results. However, the bias might still have existed, which could have limited the results acquired through these feedback sessions. For the context of this project this was not a large problem as all the concepts presented to the experts and potential end-users were possible iterations for a prototype, but more effort could have been invested in order to find and prevent these potential biases.

Another bias which might have had more impact on the outcome of the conclusions for this research was identified after the evaluation of the final prototype. The results showed a great satisfaction with bot the parent and child, but a large question mark could be added to these results. From these results it is possible to suggest that the concept of the prototype is able to support parent and child in their current situation. However, during the evaluation the participants have answered with a lot more very positive answers to the questions asked rather than critical answers. As it is certainly not likely that there are almost no improvements to be made to the prototype, a bias might be the reason behind this specific distribution of positive and negative comments. The most probable bias that caused the skewed answers is called the ‘social desirability bias’ [53]. The participants could have felt like they needed to give positive answers because they felt like this was socially desirable. The questions used in the study might have served as a probe to create a biased argumentation, as they provoked the socially desirable answer. An example of such a question could be: “Would you try to make use of this application if it were available?” [appendix A.15] The participants might have identified the effort that the researcher put in the prototype and did not deem it socially desirable to undermine that effort, and therefore were not too critical with their remarks. This however made it hard for the researcher to find the ‘but’, which was presumably still present, within their answers that is needed in order to come to stronger conclusions and future remarks.

In addition to the probable social desirability bias the reactions gained from the children participating could be questioned more specifically. All the children participating answered that they would be motivated to try and eat more foods that they do not like when making use of the application. It is however questionable whether they would actually be motivated to do so, as the children might not be able to think about their future motivation originating from the application. In addition to that, the current research was not yet connected to an eating moment due to limitations regarding availability and time constrictions. Testing the true effectivity and impact of the prototype and its concept would be a step further in enforcing the conclusions drawn in this research, to find out whether the children are actually more motivated and for how long they would be.

Nonetheless the participants were able to give a few critical insights about the current prototype, which could be used to further develop the prototype in its current status. The most important critical assessments that came from both parent and child were regarding the duration of motivational pull that the prototype could deliver. It was deemed important to keep the child attracted and motivated for longer periods of time as the eating problems can take years to improve. More critical remarks could exist, but are not possible to be identified by the current researcher.

The study that was performed in order to evaluate the final prototype in the context of this project did show some interesting themes during the analysis. The requirements that were set during the specification phase were all met, the participants were satisfied, curious, enthusiastic and were able to easily navigate the application, neglecting the suggested bias. However, the conclusions are based solely on 4 sets (1 parent, 1 child) of children within the target group. Making the number of participating sets higher would grant the possibility of creating stronger conclusions and might also unveil different new contradictions. In addition to this, it might be interesting to set- up a comparison study between the target group and a group of participants that are not within the target group. Possible iterations of this comparison could be children within the target group compared to children without Autism Spectrum Disorder or a different age. This could show the potential reach outside the target group, and the degree in which the requirements of the target group are met.

Overall, the research within the context of the project could have gone deeper into the subject. The research question stated in the beginning of the project is answered, but a lot of uncertainties exist regarding the biases that were present. The researcher has mainly ‘flown over’ the contents of information rather than actually dive into the deeper meanings and findings that were available. This delivered a set of conclusions which are not necessarily wrong, but limited within their degree of specificity and power.

8.3 Future research

The comments that are discussed in the section above can be interpretated into the following remarks and possibilities for future research:

8.3.1 Possible directions for research

Continue the current project

The findings from this project and the connected prototype could be further developed and empowered by continuing the specific project. The researcher could use the results from the evaluation of the project to improve upon the current iteration and possibly test the true effectivity and impact of the potential end-product. The improvement of the current prototype would start by incorporating more functionalities such as customizability and lengthier gameplay in order to increase the motivational pull for a diverse set of children. In addition to that specific features that are currently present could be improved such as: the statistics for parents; planting and harvesting process; and economy of the game. By improving and evaluating these additions the researcher could push the current concept further towards a potential end-product.

Single different direction

During future research a different concept could be worked out into a functional prototype and consequently assessed by potential end-users within the target group. Current findings could be taken into account and could improve the design of a different concept. An example would be that the researcher focusses more on lengthy motivation and customizability incorporated in the new concept. In addition to that, closer contact with children and their parents during the ideation, essentially letting them join the process, could lead to new interesting results. This research could then be used in order to find possible contradictions and similarities between the concept of this project and the future project. This would suggestively lead to new iterations for both concepts, or even a merging into a new concept.

Expanding the sight

During possible future research, the scope of what could motivate the child could be expanded greatly. By testing multiple functional prototypes of different nature, the source motivation of the children within the target group could be further explored to gain new insights on how to trigger these motivations. This could suggestively be done by incorporating closer contact with the potential end-users, by diving deep into their habits and likings. In addition to that, different methods or features of trying to reach the child's motivation could be evaluated with the potential end-users in order to find the effectivity of the different methods. By getting more insight on these triggers, the concepts could be improved in their effectiveness. These findings could be used to further define the best possible concept to improve upon the current situation.

8.3.2 Remarks for improvement of quality

For all directions taken during future research, these remarks should be taken into measure in order to enlarge the power of the possible conclusions and therefore improve the quality of the research:

- Obtain a closer view in order to get a deeper understanding of the target group.
- Include the intellect from potential end-users to a higher degree in the form of more studies, for example: include the parents of the children in the process of generating ideas during the ideation phase.
- Increase the number of participants in order to create more diversity and power within the set of participants.
- Avoid possible biases such as the social desirability bias to a higher degree.

9. Conclusion

The important question is however, can we give an answer to the research question stated in the beginning of the project: “How to support children with autism spectrum disorder and their parents in better eating habits?”

During the different phases of the project, it has become clear that the target group is very diverse, making it suggestively hard to satisfy a large portion of the target group. Age did not seem to be a differentiating factor within the evaluation of the current concept, but the personalities of the children showed some larger differences as the children addressed different possible new features related to their hobbies and likings. During the different conversations with all the stakeholders this specific diversity has shown in the form of various requirements and values that the children and their parents keep. During the evaluation of the concepts and prototype it came to light that the characteristics found during the background research were sufficient in order to satisfy the needs of the children within the target group, for at least the current status of the research.

The means of making use of a game in the form of an application were further explored by creating and evaluating a functional prototype. The overall satisfaction that was shown during the evaluation of the prototype is suggestively high but some biases most likely exist. The participants were happy to see the current concept and added that they wanted to make use of the end-product. However, the participants did not give a lot of constructive criticism, most likely due to the social desirability bias. More research is needed in order to define the true impact and effectivity of such an application which the prototype resembles. However, it can be suggested that the current concept and the means of using a game in the form of an application is a possible strategy to have a positive effect on eating problems of the child, as the evaluation of the prototype has shown a positive response. The children were curious and enthusiastic, which seemed to motivate them to push onwards.

So, the concluding answer to the research question based on the discussed findings during the evaluation of the prototype would be: It is suggested to be possible to support parent and child against the child’s eating problems by making use of a game in the form of an application, if the designer keeps the core characteristics of autism spectrum disorder in mind.

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Appendices

A.1 Paper on FNPE

Influences on Food neophobia and Picky/Fussy eating (FNPE) of children

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I. Introduction

THE consumption of food is a basic human need, it is important to keep a well-balanced diet which consistently satisfies the basic human need for nutrients and vitamins. Almost all toddlers encounter phases in which eating is a problem. During these phases the eating patterns of the children is deficient and could, in the long run, create serious conditions such as eating disorders, fatigue and vulnerability for infections. There is a large amount of children that encounter these "bad-phases" for long times, resulting in serious conditions and behavioural problems. To solve this problem, the toddlers should be motivated to try and keep up with eating patterns that are able to fulfil their basic needs. To be able to do so, more information is needed about the influences that affect children. The goal of this literature review is to get more insights on how the eating patterns of young children are being influenced, and how they can be supported to adapt a more healthy and sustainable eating pattern. The new insights will be used in the process of a graduation project that aims to create a technological intervention for, a large part of, the stated problem in this literature review. Firstly this literature review will touch upon different aspects of eating disorders and what those entail. After that the focus will shift towards the influences that can either deteriorate or improve the situation of children with eating disorders.

A. Food Neophobia and Picky/Fussy eating (FNPE)

Disruption within the eating pattern can be caused by two distinct behavioural sources. According to Dovey et al.[1] there exists a clear distinction between 'picky/fussy' eating and neophobia, both having their own distinctions. On the one hand, there is food neophobia which is defined as the reluctance to eat food that has not been eaten before, suggesting that novelty of foods is the biggest drive of the disruption in the eating pattern. This can stretch further than just familiarity with food, as Salvy et al.[2] discovered that the prescensce of a familiar person such as a sibling could increase the food intake of children significantly. It should be noted though that the food that was used for this research was a cookie and not a healthy food, so more research could be done there. On the other hand however there is picky/fussy eating which is revolved around not eating foods that are mostly familiar to the person. To add up to that picky/fussy eating can stretch further than just the rejection to the food in itself but also towards the taste or structure of the food.

Even though there are some structural differences between the two sources of eating disruptions, they also lay within the extent of one another. As is portrayed in the paper[1] food neophobia if often a part of picky/fussy eating, however picky/fussy eating is not part of food neophobia. It is important to be noted that food neophobia is a common thing with children due to the learn to eat foods (bitter foods). With age food neophobia should decrease, but in the case of picky eaters this is often not the case. Whilst overcoming food neophobia is a key process in creating a healthy and sustainable diet for humans.

B. Influences on Food Neophobia and Picky/Fussy eating

Parental influences are important factors when children are picky eaters or have trouble with food neophobia. In a research[3] among around 200 children and their parents tried to find out whether there is a relation between different parental feeding practices: pressure feeding, healthy home foods, monitoring and teaching. Resulting the research[3] it was found that pressure feeding has a positive relation to FNPE, making it counterproductive when trying to let the child eat. However creating a healthy home food environment was proven to be a productive way to diminish FNPE. Controlling methods such as rewarding, restricting or pressuring were found[3] to impact the eating behaviour of a child negatively and should therefore not be used of a frequent basis. But parents should not be scared to participate, when researching the effects of gamification during eating practices Sigrid et al.[4] found that participation of parents during tastings and other activities during dinnertime significantly decreased food neophobia of young children. It is apparent that parental influences can play a key role regarding FNPE.

The early years in life are key when it comes to eating patterns of children. As found in a review by Nicklaus et al.[5], the eating patterns that are formed during early childhood, being years 1-3, can be extended throughout the rest of the childhood. Interestingly in another research Nicklaus et al. [6] found that children around the age of 3 that are enabled to make their own choices encounter a decrease in variety of food consumption, this suggests that they are able to make their own choices at this stage in life. This is in line with the proposed lifespan model of food neophobia of Terrence et al.[1] where food neophobia peaks around the age of 3. Clearly the children have developed more complex decision-making resulting in them rejecting novel foods.

There are possibilities for working towards healthy eating patterns at early stages in life. Breastfeeding and repetitive representation of food are important practiced that positively influence eating patterns during these years[5]. Negatively

affecting the child at young ages is also possible, as it is found[7] that pressure feeding fruits at the age of 1-year will decrease the consumption of vegetables at the age of 2-years. Social facilitation[8] has an important impact on the eating pattern of a child, meaning that modelling healthy eating behaviour can have positive effects on the eating pattern of the child. This shows that parental influences are important factors for the eating pattern of children, but more research can be done to find out the significance of some influences.

Creating familiarity with different foods can be an important tactic to empower a healthy eating pattern for children, since novelty is counteracting. As stated before, food neophobia [1] is defined as the rejection of foods that are novel to the child. In the review 6 has found that familiarity of foods with the child can greatly improve the eating pattern of children, because a child's diet is mainly constructed from what the child like to eat.

Familiarity and novelty are entangled with clear types of feelings. As Alridge et al. [9] have reviewed, familiarity comes with a strong feeling of comfort which will help with tasting new novel foods. This feeling of comfort can be created by constant exposure to the food in the child's environment. However, this can be a tight situation as 'not knowing' is mostly associated with fear and suspicion[9]. This decreases the perceived associations to the consumption which can be impactful as associations, either bad or good, of encounters with food can be crucial [9] for the attitude of a child towards that food.

Besides letting the child taste and feel the foods, letting a child participate in cooking activities can be utilized to expose children to novel foods. It is experimentally confirmed[10] that involving children in cooking activities can provoke children into directing their food choices towards novel foods. During the experiment the children that cooked were significantly more willing to not only eat novel foods, but also eat more vegetables. [11]Hands-on experiences tend to work well to nudge children towards better eating patterns but theoretical teaching seems to have no significant effect on the behaviour as just giving plain information has no impact on the dietary choices of children.

The exposure to novel foods can have positive effects on the willingness to try other novel foods. In a research performed[12] two subsets of children, differentiated by age, were exposed to novel-good, novel-bad and familiar-good foods, afterwards their willingness to try novel foods were measured. It was found[12] that children of aged 10-12 that were exposed to novel-good foods were significantly more willing to try other novel foods, whilst younger participants were not susceptible for these manipulations.

There are other manipulations that can play part in the willingness to take a leap into the unknown, through the manipulation of arousal. Arousal is something that needs to moderately be fulfilled for humans [13] to perform well in situation where hedonism is involved. In the research performed it was found that when the arousal was manipulated towards a lower standard than normal, participants were more willing to try new types of food as these actions generates new arousal. It is important to be noted that these tests [13] were performed with adolescents instead of children and that further research has to be done regarding children.

II. Conclusion

The goal of this literature review was to get more insights on the influences that play a part in disruptions of the eating patterns of children, and how they could be supported to adapt a more healthy and sustainable eating pattern. During early childhood the eating pattern of children is often disrupted by food neophobia and pickyeating, where food neophobia can be part of picky/fussy eating. This is partly due to the development of complex decision-making within the child when it reaches the age of 3-years. Parental influences can be very impactful on either the diminishing or increasing of both food neophobia as well as picky/fussy eating. Feeding practices such as force feeding, rewarding and restricting are counterproductive and should be averted in any way. On the other hand practices such as a healthy home food environment and family participation are proven to decrease food neophobia. To decrease the chances and/or severity of food neophobia with children action is preferred at a very young age as the eating pattern during younger years can often be extended through the rest of childhood.

Another influential aspect is familiarity of the children with foods. When a child has more familiarity with a type of food the willingness to eat is significantly higher, because of the comfort that is associated with familiarity. A method that can be utilized to enforce a child's familiarity with food is by letting them participate in cooking activities. This way the child can have hands on experience with food which should decrease the food neophobia, however more research has to be performed to ultimately prove this. Encounters with novel foods tend to have a positive effect on the willingness to try other novel food as well, but only is the experiences with novel foods are adequate. It is clear that there are a lot of influences and means at play, keeping close attention to them is therefore useful.

The new insights deliver useful information that can be used to continue working on a technological intervention for children with eating disorders, however some additional information on the usage of technology is needed for that particular project. There is however a lot of future work that could be done in this particular field, as a lot of influences are not yet proven to have a significant impact on the eating behaviour of children. In addition to this the information available sometimes vary greatly in age whilst the brain of children changes a lot through the years, making age a variable that needs to be accounted for more.

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A.2 State of the art examined apps

Learn play eat [54]

Link: https://apps.apple.com/app/id1377533159 - https://learnplayeat.com/

The “learn play eat” app is created to support parents and other caretakers of children that are picky eaters. The app tries to achieve this goal by the means of some different techniques. Firstly, the user (child) receives different tasks that are connected to the food of choice, this could for example be looking, touching or even tasting specific foods. If the child has performed a task, experience points will be added so the user can progress through the game. When specific tasks are performed for a first time or other achievements are obtained, the user will receive a certificate to print and color. The app is designed in a very playful manner and a small mascot is present.

Availability: IOS only **Cost:** Free

Pro’s & Con’s

- App is read-only, could prove difficult for young children that cannot read yet
+ Progression through levels
+ Playful + Interactive + Personal
+ Progress is being kept in a scoreboard

Peekaboo Fridge [55]

Link: https://apps.apple.com/us/app/peekaboo-fridge/id554188081

Through the usage of cartoonish pieces of food that sing and dance, this app is trying to increase the familiarity of fruits and vegetables with children. When using the app, the user can open a fridge in the middle of the screen, inside the user will find different kinds of food. Every time the door is opened another piece of food is presented and explained.

Availability: IOS only **Cost:** $1,99

Pro’s & Con’s

- Only a small variety in fruits and vegetables
- very repetitive - not very interactive
+ Fun to look at + Playful
+ not a lot of reading

Taste with tiny [33]

Link: http://tastewithtiny.com/

In “taste with tiny” children are never eating alone anymore, because the mascot called tiny eats together with them. With every drink, snack or meal this app can be used. The caretaker has to set a timer in which both tiny and the child have to have finished the portion, when the timer starts both have to start eating. A picture of the food has to be taken and will be used to create a plate for tiny, who will give some encouraging words while eating. After the meal is finished the app wants to know how much has been eaten by the child and accordingly some rewarding coins will be given. With these coins some cosmetic items for tiny and his spoon can be bought. Lastly, there is also a story mode to help engage with tiny.

Availability: IOS + Android **Cost:** Free trial (After that

Pro’s & Con’s

- Not many rewards to purchase - story mode is very small
- no progress kept
+ eating together with tiny makes it more fun + interactive
+ usage of a mascot to convey a message and support

Toca kitchen series [56]

Link: https://play.google.com/store/apps/details?id=com.tocaboca.tocakitchen2&hl=nl

The toca kitchen series are originally developed as a game without any educational intent. However, it is still included in the list as it is played by lots of children and can help to

empower familiarity with foods amongst children. In toca kitchen the user is challenged to cook dishes for guests, the process of cooking is minimalised into simple short steps but still convey the complete picture of cooking a whole dish. If the cooking is performed correctly the user can view the guest eat their foods with joy.
Availability: IOS + Android **Cost:** Free
Pro's & Con's
- No tutorial - No progression
- Not educational
+ playful + usage of fun characters
+ wide variety of possibilities

Cute food [57]
Link: https://apps.apple.com/us/app/cute-food-creative-fun-fruits-vegetables-healthy-funny/id648773321
The cute food app gives the user a safe space to create art with pieces of food. When starting the user can choose a plate to start with, after that the user is completely free to make whatever he\she want with the 200+ pieces of fruit available. The palette of foods mostly consists of fruits and vegetables that can be found in most supermarkets, which enables recreation in real life. As is stated in the description of the app: "Food that looks good, tastes better".
Availability: IOS only **Cost:** $2,99
Pro's & Con's
- costs some money - no challenge
+ a lot of room for creativity + enables for recreation in real life
+ playful + creations can be saved and shared

Dr. Panda's restaurant [58]
Link: https://play.google.com/store/apps/details?id=com.drpanda.restaurant3&hl=nl
'Dr. panda's restaurant' delivers a fun experience to its user, while educating them in the ways of cooking. As opposed to the earlier mentioned "toca kitchen series", "panda's restaurant" delivers a less open approach in the sense of recipes that have to be followed. The user has just opened a new restaurant and cooks the food for its customers, if the customers like the meals prepared a reward will be granted. When advancing through the game, the user is exposed to more foods and cooking techniques that show how fun food can be.
Availability: IOS + Android **Cost:** Free
Pro's & Con's
- could be more educational - no room for creativity
+ playful characters + Progression implicated
+ very interactive

iEat [59]
Link: https://atlanticpediatricdeviceconsortium.org/ieat-application-helps-treat-children-feeding-disorders
Firstly, it should be noted that this app is no longer available due to uncertain reasons, however the origin of the app is interesting enough to include it. The app was created in collaboration with doctors that treated children with eating disorders. The problem was that there were too many children to handle at once, so they needed an aid to help children develop better eating patterns. The app essentially digitalized an already existing flowchart and made it possible to register the progression that was being made. This way the doctor could easily see what was happening while the app played as assistant at home.

Availability: not available **Cost:** -
Pro's & Con's
- not available anymore - does not seem fun to use
+ makes the progress of reading the flowchart faster + tailored treatment
+ progression kept and sent to doctor

Recipes for kids (Dutch) [60]
Link: https://play.google.com/store/apps/details?id=com.endless.recipesforkids&hl=nl
There are a lot of apps that serve as a cooking book for children, this is one that was found when looking around. The app is focussed on recipes that both parent and child can make together. The recipes inside the app are simple, healthy and above all very playful, which can be helpful when trying to let a child engage with food. The recipes are clear and combined with various facts about for example the calorie count and the time to make.
Availability: IOS + Android (different developers) **Cost:** Free
Pro's & Con's
- not interactive
+ playful & healthy recipes + favourite recipes can be saved
+ clear in language

Chef koochooloo [61]
Link: https://chefkoochooloo.com/
This app has a strong educational focus on recipes around the world. When using the app, the user can twist around the globe and choose any country, when a country is clicked a new tab opens with information about that country. After that some recipes are shown and the app tells the user how to make that dish. After the dish is completed the user gets some fun facts and learns how to say "enjoy your meal" in that country.
Availability: IOS + Android **Cost:** Free
Pro's & Con's
- Might be very overwhelming for children - app does not work optimally
- Pictures of food are not very appetizing - language is difficult
+ fun to traverse the globe and find new recipes + ability to save your meals
+ playful + interactive

Kids food adventure [62]
Link: http://www.app-store.es/kids-food-adventure
In 'Kids food adventure' the child and parent are encouraged to try new foods and "challenge the tastebuds". In the app a great variety of colourful photos can be found, these are meant to increase the familiarity of new foods with the children. In addition to this some recipes can be found inside the app that are explained in a child/parent friendly manner. The foods and recipes that are available are not only on a mostly healthy basis but are also seasonal. When a new type of food is tasted the user receives a sticker that is connected to that food, these stickers are put together on one big scoreboard.
Availability: IOS only **Cost:** Free
Pro's & Con's
- Outdated
+ rewarding + educational
+ easy to use for parent and child + great variety

When to wonder: picky eating [63]
Link: https://play.google.com/store/apps/details?id=org.nyumc.pickyeater

This app is not only created to help parents and their children but also to research the relation between the eating patterns of children and the awareness of their parents. In the app the children will swipe some foods to the left (yuck) and the right (yum) and will play some small games, to get better insight in the interests of the child. The parent will also answer some playful questions to show what he\she knows about the child's eating habits. In the end the parent gets an overview of the reality and their assumptions, then some tips and tricks are given to help the parent handle the situation better.
Availability: IOS + Android **Cost:** Free
Pro's & Con's
- can only be used once to get information - not very rewarding
+ playful interactions +useful information for parents
+ used for extensive research + both parent and child play together

PR eating disorder management [31]
Link: https://play.google.com/store/apps/details?id=com.recoveryrecord
Important to note here is that this app is not created for children but for adults, however the app can lead to new insights for a child-based app. This app is created to help people with eating disorders to plan their meals. The app has a communication platform as well to communicate with other people but more importantly with professionals that could help and encourage. The user can show their experiences with certain situations by the use of Likert scales and see how he/she progresses. To add up to that, a reward system is built in to encourage the user even more.
Availability: IOS + Android **Cost:** Free
Pro's & Con's
- Not for children - not much interactivity
+ easy contact with professionals + a platform to share your victories
+ progression implemented + rewarding
+ Focus on eating disorders

A.3 State of the art examined physical technologies

Kid's dinner tray [38]
Link:
https://www.amazon.com/dp/B06XSH1X81/ref=as_sl_pc_qf_sp_asin_til?tag=trialbystorm3-20&linkCode=w00&linkId=8d19c76f39352cda80ee5ca548337a70&creativeASIN=B06XSH1X81
The plate is specially designed to encourage children to eat their whole plate empty. The plate is divided into small steps in which food can be placed, with in the end a closed step where a rewarding surprise can be placed underneath. The plate can be themed in many different styles to completely fit a child and is filled with motivational words to keep on eating to the end.
Cost: $20, -
Pro's & Con's
- repetitive
+ useful to create portions of various foods + playful
+ rewarding

Small games with food [64]
Link: https://parenting.firstcry.com/articles/8-interesting-food-games-for-kids/
In the link above some small games are listed that parents can play together with their children to make eating fruits and vegetables more fun. Examples of the games listed are: painting with yoghurt and fruits; hunting for a treasure in a bowl of yoghurt a fruit; blindfold guessing foods and gardening. These small games are meant to increase the familiarity with foods and encourage to try new foods.
Cost: dependant on game (mostly low-cost)
Pro's & Con's
- effortful - needs planning
+ room for creativity + interactive
+ playful and fun

Smart speakers [37]
Link: https://www.internetmatters.org/resources/smart-speakers-set-up-safe-guide/
There is a large variety in smart speakers available to use inside homes, which can help with specific tasks. The smart speaker can transform specific linguistic inputs into outputs such as playing music or talking back. Children with special educational needs or disabilities can also benefit from these speakers as the usage of keyboards is removed from the equation, the child can just talk to the speaker and get a reaction. The speakers that are available now are not able to effectively help for children with eating disorders but the idea can be remodelled into something that can. Think for example about a speaker disguised as a friendly toy that encourages the child during dinnertime to empty their plate.
Cost: €70/€110 (currently available smart speakers)
Pro's & Con's
- Not currently available in the needed form - expensive
+ very interactive + no need for typing and spelling
+ encouraging + could be playful

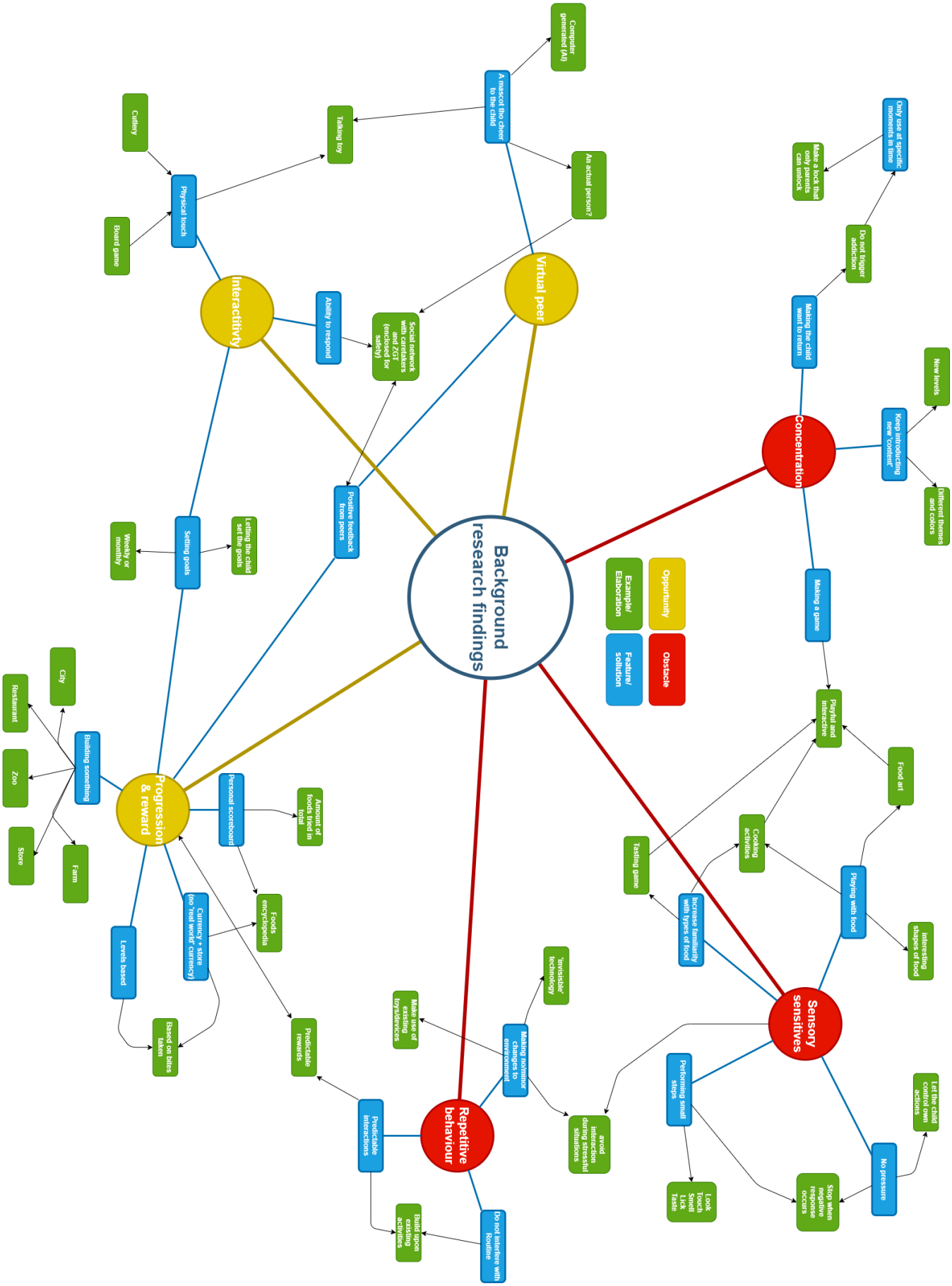
Cozmo the robot [36]
Link: https://www.digitaldreamlabs.com/pages/cozmo

Cozmo is a small robot that can be your new companion, especially children are often reacting positive towards cozmo. Cozmo can show some emotions and react to things the user says and shows. He is not originally programmed to encourage children with eating their foods but Cozmo comes with a useful guide to help and program him the way you like. Therefore, with some smart programming he could potentially help a child with his/her eating habits. If it is not achievable with Cozmo, the idea of a friendly robot supporting a child is interesting nonetheless.
Cost: $185 (currently sold out)
Pro's & Con's
- Expensive - needs extensive programming
+ a new friend for children + encouraging
+ playful + interactive + physical (real feel)

Twirling fork [65]
Link:
https://www.amazon.com/gp/product/B001HXD4U2/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=whatmomslove-20&linkId=5631e1102e59a7bf22cd4a2ed7067939
This fork is not just an ordinary fork, it is a twirling fork. When the button is pressed the fork starts twirling around, making your food quickly twirl around your fork. It is especially fun to use when eating pasta or noodles as these can be easily twirled around your fork.
Cost: currently unavailable
Pro's & Con's
- only works with specific foods - not very encouraging
- potential to make a big mess
+ makes eating more fun

Vegetable cutters [66]
Link:
https://www.amazon.com/dp/B085PRLT2N/ref=sspa_dk_detail_0?psc=1&pd_rd_i=B085PRLT2N&pd_rd_w=87uWe&pf_rd_p
Children often do not even like the sight of fruits and/or vegetables. By making use of vegetable cutters the parent can create fun and interesting shapes from fruits and vegetables and turn an unhappy experience into a more fun one. The cutters come in many different shapes and sizes and are widely available.
Cost: €15, - (different options available)
Pro's & Con's
- will become repetitive - cuts of large part of vegetable/fruit
+ makes eating vegetables more fun + might encourage consumption of vegetables/fruits

A.4 – Mind map


Background research findings
Example/ Elaboration
Oppurtunity
Feature/ solution
Obstacle
Interactivity
Cutlery
Board game
Physical touch
Talking toy
Ability to respond
Virtual peer
Computer generated (AI)
A mascot tho cheer to the child
An actual person?
Social network with caretakers and ZGT (enclosed for safety)
Positive feedback from peers
Concentration
Only use at specific moments in time
Make a lock that only parents can unlock
Do not trigger addiction
Making the child want to return
Keep introducing new 'content'
New levels
Different themes and colors
Making a game
Progression & reward
Setting goals
Weekly or monthly
Letting the child set the goals
Personal scoreboard
Amount of foods tasted in total
Foods encyclopedia
Currency + store (no 'real world' currency)
Levels based
Based on bites taken
Building something
City
Restaurant
Zoo
Store
Farm
Predictable rewards
Repetitive behaviour
Predictable interactions
Build upon existing activities
Do not interfere with Routine
Making no/minor changes to environment
Make use of existing toys/devices
'invisible' technology
avoid interaction during stressful situations
Sensory sensitives
Playful and interactive
Food art
Cooking activities
Tasting game
Playing with food
Decrease familiarity with types of food
interesting shapes of food
Performing small steps
Look
Touch
Smell
Lick
taste
No pressure
Stop when negative response occurs
Let the child control own actions

A.5 – list of 50 ideas

1. Building a city game
2. Manage your own farm
3. Food encyclopaedia
4. Make your own food art
5. Funny food slicer
6. Talking cutlery
7. Talking toy/animal
8. Little robot
9. Chef helper
10. Talking hat
11. Race to goal, set own goals
12. App with progression statistics
13. Puzzle game which you can solve by taking bites
14. Small interactive movies
15. Safe social media
16. Board game
17. Card game
18. Virtual reality environment
19. Advent calendar
20. Trophy case
21. Plate with light sensors and vibrations
22. Recipes for kids
23. Link the taste/texture to the foods
24. Cooking game
25. Grow a plant by tasting
26. Scoreboard of things tried
27. Conquer the world
28. Fun quizzes about foods
29. Food rating system, what did you like?
30. Defend your castle by eating
31. Make your own special menu
32. Prison with reward in it
33. Drive through, when a customer comes eat
34. Thermometer rising to goal
35. Sticker wall
36. Ranking vegetables of liking
37. Car/boat/plane on track that moves with bites
38. ‘schubjes’ (swimming lessons)
39. Interactive light
40. Book to keep track
41. Dice, what to do? Look touch lick taste eat
42. Making music by trying foods
43. Good and bad foods, place in the right place (bin and plate)
44. Prepare vegetables in app, and then get them in real life
45. Origami, folding the foods
46. Smoothie maker, with different vegetables
47. Animals that talk about the foods they like
48. Blind box, to feel and taste the foods
49. Empty the van, and it will be refilled with nice treats
50. Feed small puppets to get a reward from them

A.6 – Downgrading the ideas

Downgrading phase one

1. ~~Building game~~
2. Manage your own farm / building game
3. Food encyclopedia
4. ~~Make your own food art~~
5. ~~Funny food slicer~~
6. Talking cultery/toy/hat
7. ~~Little robot~~
8. ~~Chef helper~~
9. ~~Race to goal, set own goals~~
10. App with progression statistics
11. Puzzle game which you can solve by taking bites
12. ~~Small interactive movies~~
13. Safe social media
14. ~~Board game~~
15. ~~Card game~~
16. ~~Virtual reaility environment~~
17. ~~Adventcalendar~~
18. ~~Trophy case~~
19. ~~Plate with light sensors and vibrations~~
20. ~~Recipes for kids~~
21. Link the taste/texture to the foods
22. ~~Cooking game~~
23. Grow a plant by tasting
24. Scoreboard of things tried
25. Conquer the world
26. ~~Fun quizzes about foods~~
27. ~~Food rating system, what did you like~~
28. Defend your castle by eating
29. ~~Make your own special menu~~
30. Prison with reward in it
31. ~~Drive through, when a customer comes eat~~
32. Thermometer rising to goal
33. ~~Sticker wall~~
34. ~~Ranking vegetables of liking~~
35. Car/boat/plane on track that moves with bites
36. ~~'schubjes' (swimming lessons)~~
37. ~~Interactive light~~
38. ~~Book to keep track~~
39. ~~Dice, what to do? Look touch lick taste eat~~
40. ~~Making music by trying foods~~
41. ~~Good and bad foods, place in the right place (bin and plate)~~
42. Prepare vegetables in app, and then get them in real life
43. ~~Origami, folding the foods~~
44. ~~Smoothie maker, with different vegetables~~
45. ~~Animals that talk about the foods they like~~
46. ~~Blind box, to feel and taste the foods~~
47. Empty the van, and it will be refilled with nice treats
48. Feed small puppets to get a reward from them

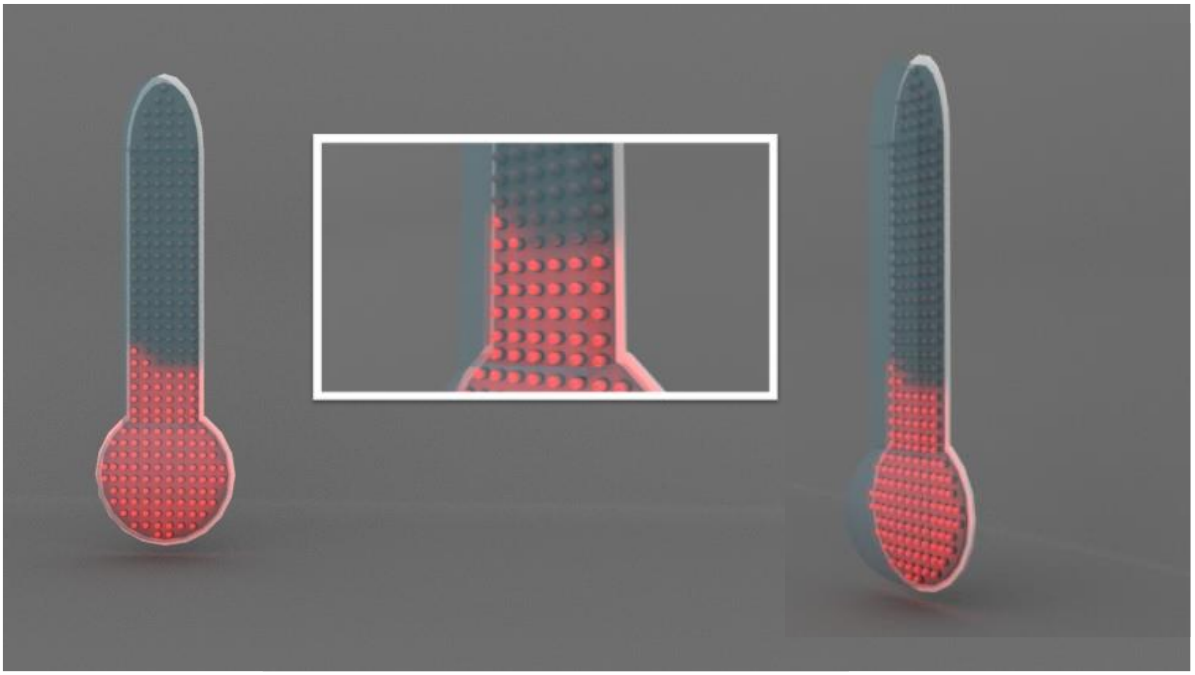
- Merged talking things (peers)
- Removed ideas that are too hard (such as videos)
- Removed ideas that are too expensive (VR)
- Removed ideas that are rather potential adding features
- Removed ideas with counterproductive features
- Removed ideas that are already widely available
- Removed ideas that were considered generally less than the others.

Downgrading phase 2

1. Manage your own farm / building game
2. Food encyclopedia / conquer the world
3. Talking cutlery/toy/hat
4. ~~App with progression statistics~~
5. ~~Puzzle game which you can solve by taking bites~~
6. Safe social media
7. ~~Link the taste/texture to the foods~~
8. Grow a plant by tasting
9. ~~Scoreboard of things tried~~
10. ~~Conquer the world~~
11. ~~Defend your castle by eating~~
12. ~~Prison with reward in it~~
13. Thermometer rising to goal
14. Car/boat/plane on track that moves with bites
15. Prepare vegetables in app, and then get them in real life
16. ~~Empty the van, and it will be refilled with nice treats~~
17. ~~Feed small puppets to get a reward from them~~
18. Empty something, to have it refilled with a reward

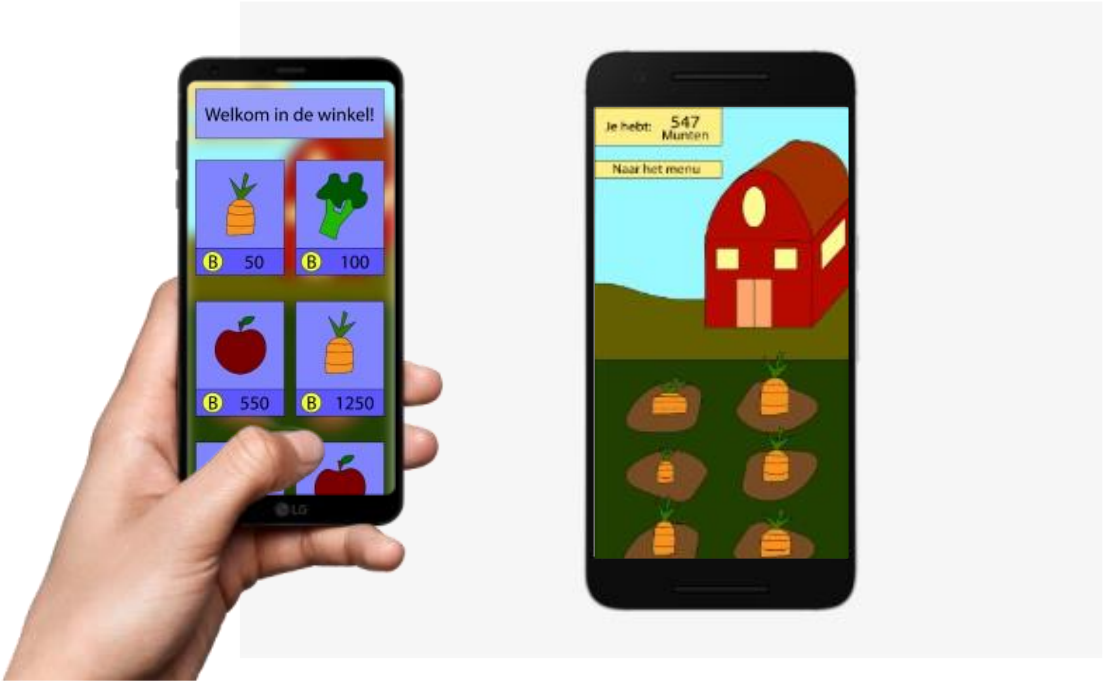
- Removed scoreboard and app with progression statistics, it could be a nice thing to add later to an concept, but is not considered to be enough to stand alone
- Merged ‘empty the van’ and feeding puppets as the general idea is similar.
- Removed the puzzle game revolving taking bites, as this would take a lot of attention during dinnertime.
- Removed linking the taste and texture to foods as this can only be performed once or twice.
- Merged food encyclopaedia and conquer the world

A.7 – Visualisation concept 1 : Thermometer



A.8 – Visualisation concept 2 : Interactive Plate

A.9 – Visualisation concept 3 : Farming app



A.10 – Feedback session questions (Dutch)

Introductievragen:
What is the age of your child?
What is the gender of your child?

Het doel van deze vragen is om eventuele meningen een goede plaats te geven. De ouders van een heel jong kind geven mogelijk hele andere antwoorden dan die van een ouder kind. Hetzelfde geld mogelijk voor ouders van jongens/meisjes.

Vragen per concept (3x)
Begrijp je het voorgelegde concept aan de hand van de visualisaties en de beschrijvingen?
Heb je nog vragen over het voorgedragen concept?
Doel: om er zeker van te worden dat de deelnemer een goed begrip heeft over het voorgestelde concept, eventuele vragen kunnen zo makkelijk uit de lucht worden gehaald. Daarnaast is het ook mogelijk om de deelnemer uit te dagen om een korte samenvatting te geven, zodat het zeker wordt dat er begrip is.

Wat zijn je eerste gedachtes over dit concept?
- Zou je iets aan willen passen/toevoegen? Zo ja, wat?
- Vind je iets heel goed werken? Zo ja, wat?

Wat is uw algemene oordeel van dit visueel uitgewerkte concept?
- Uitleg?

Doel: dit is een van de belangrijkste onderdelen van het gehele interview, gezien we hier op zoek kunnen gaan naar een argumentatie voor en tegen de verschillende concepten. Het is belangrijk om de eerdere vragen mee te nemen in dit oordeel, en de deelnemer voldoende ruimte te bieden om uitleg te geven.

Eindvragen:
Welk concept spreekt u het meeste aan?
- Waarom?

Welk concept spreekt u het minste aan?
- Waarom?

Doel: met deze vragen willen we een duidelijk beeld scheppen over de rangorde die de deelnemers voor zichzelf hebben gemaakt over de concepten. Dit kunnen wij gemakkelijk gebruiken om een snel oordeel proberen te vestigen over de verschillen tussen de concepten.

Wilt u nog iets toevoegen?
Heeft u zelf nog ideeën?
Heeft u nog vragen?

Doel: een goede afwikkeling van het interview maken, hier geven we de deelnemers nog even de ruimte om eventuele vragen/opmerkingen kwijt te kunnen. Daarnaast is het nog interessant om te kijken of de deelnemers zelf nog met verrijkende ideeën kunnen komen, mogelijk kunnen we deze implementeren.

A.11 – Information Brochure (Dutch)

Informatiebrochure

Dinner Time!

Deze brochure is bedoeld om u meer informatie te geven over het onderzoeksproject: ‘Dinner Time!’ Wij leggen in deze brochure uit wat het betekent om mee te doen aan dit onderzoek, en wat er gebeurt met de verstrekte informatie. Dit onderzoek wordt uitgevoerd in samenwerking met de Universiteit Twente en ZGT en heeft als doel om meer informatie te verkrijgen over uitgedachte concepten die kinderen met autisme en eetproblemen moeten ondersteunen.

Kinderen met autisme hebben vaker last van eetproblematiek en dit kan kwakkelen van de gezondheid met zich meebrengen. Het is daarom van groot belang om kinderen te ondersteunen om hun houding ten opzichte van het gepresenteerde voedsel veranderen. Forza (praktijk binnen ZGT) levert ondersteuning voor zowel kind als verzorger aan huis en is op zoek naar een interventie die hen kan helpen in het dagelijkse leven, wanneer de verzorgers van het Forza niet aanwezig zijn. De interventie moet de betrokken partijen (kind, ouder/verzorger, zorgverlener) een ondersteuning leveren om effectiever om te gaan met de eetproblematiek.

Voor meer vragen kunt u terecht bij Jasper J. van de Bovenkamp, waarvan de contactgegevens onder aan het document toegevoegd zijn.

Het onderzoek

Om een goede keuze te kunnen maken tussen verschillende uitgedachte concepten willen wij graag uw mening hebben. Wij zullen u een aantal gevisualiseerde concepten laten zien, en daarna om uw mening vragen om er achter te komen wat u aanspreekt en wat niet. Onder gevisualiseerde concepten verstaan wij de volgende zaken: 3D-modellen, interfaces, schetsen, en beschrijvingen. De vragen zullen volledig over uw mening van zowel de concepten zelf als de visualisaties daarvan gaan. De informatie die wij uit uw antwoorden halen kunnen wij gebruiken om een gegronde keuze te maken tussen verschillende mogelijke concepten die het ondersteunen van een verandering in eetgewoontes als doel hebben.

Deelnemen aan dit onderzoek is ten alle tijden vrijwillig en zal ongeveer 45 minuten in beslag nemen. Het is op elk moment mogelijk om zonder het geven van een reden uit het onderzoek te stappen, tot 72 uur na het plaatvinden van de interactie.

Het verloop van de het onderzoek

Het is voor ons belangrijk om te streven naar openheid van zake in dit onderzoek, gezien wij u niet voor onvoorziene verassingen willen plaatsen. Ten tijde van het onderzoek krijgt u meerdere malen een (visueel) uitgewerkt concept te zien, waarvoor u telkens voldoende tijd krijgt om het concept te bestuderen. Nadat u het concept hebt bestudeerd zullen wij een aantal vragen stellen over uw perceptie van het concept, wat vond u bijvoorbeeld goed/slecht werken. Dit zal meermaals achter elkaar gebeuren waarna u gevraagd wordt om de concepten te rangschikken, van de beste tot de slechtste. Wij zullen hierin te allen tijde objectief blijven, en dus geen mening geven over de gekozen rangorde. Wenst u alleen mee te werken in een deel van het onderzoek is dit te allen tijde acceptabel. Het interview zal plaatsvinden door middel van een videoverbinding, hiervoor gebruiken wij Microsoft Teams als medium. Wij nemen het gesprek graag op zodat wij uw antwoorden op een later moment

op correcte wijze kunnen verwerken. Op deze manier hopen wij de kwaliteit van het interview hoog te houden, gezien wij onze onverdeelde aandacht aan uw antwoorden kunnen schenken. Het is ook altijd mogelijk om aan te geven dat slechts audio op mag worden genomen of om zelfs geen opnames te maken. Meer informatie over de verwerking van de videobeelden kunt u verder in dit document vinden, onder het kopje *"(video) opnames*".

Gegevens
De verstrekte gegevens worden gebruikt om wetenschappelijk onderzoek uit te voeren, een afstudeeropdracht van de Universiteit Twente in het specifiek. Het is mogelijk dat dit onderzoek openlijk gepubliceerd zal worden op het internet en media. Dit maakt het ook mogelijk dat toekomstige onderzoeker of ondernemer gebruik zal maken van de verstrekte resultaten, hier zullen ten allen tijde anonieme resultaten afgebeeld worden. Het zal daarom nooit mogelijk zijn dat uw persoonlijke informatie terug te vinden is in de verwerkte resultaten. De gegevens waar wij hier over spreken zijn samenvattingen van de antwoorden die u op de gestelde vragen heeft gegeven. Wij zullen deze samenvatten door mogelijke persoonlijke onderdelen van uw antwoorden te verwijderen, en slechts de essentie van uw oordeel te gebruiken.

(Video) opnames
Om er voor te kunnen zorgen dat wij een effectief interview met u kunnen houden en na dit interview de informatie goed te kunnen verwerken, maken wij graag een opname van ons interview. Wij zullen er alles aan doen om uw privacy volledig te respecteren, en zullen daarom netjes omgaan met de videopnames. Wij zullen de resultaten op anonieme basis uit de videobestanden ontnemen, en deze vervolgens verwijderen. De onderzoeksgegevens worden volgens de VSNU richtlijnen 10 jaar lang bewaard.

Toegang van gegevens
De gegevens die wij verzamelen zullen ten alle tijden alleen toegankelijk zijn voor de onderzoekers die onderaan deze brochure vermeldt staan. Nadat uw antwoorden op de gestelde vragen geanonimiseerd en verwerkt zijn door de onderzoekers zullen deze per direct verwijderd worden. De gegevens zullen dus nooit publiek worden gemaakt of voor promotionele doeleinden worden gebruikt. Uitzondering treedt op wanneer de desbetreffende deelnemer zelf anders aangeeft.

Terugtrekken van gegevens
Zoals eerder vermeld is het mogelijk om u tot 72 uur na de oorspronkelijke interactie terug te trekken uit het onderzoek, waarmee al uw gegevens per direct verwijderd zullen worden zonder enige tegenspraak. Wanneer deze 72 verstreken zijn zullen de onderzoeksresultaten verwerkt worden in het onderzoek en is het niet meer mogelijk om deze terug te trekken.

Contact
Mocht u graag contact met ons opnemen over deze informatiebrochure en het verdere onderzoek kunt u contact opnemen met de volgende onderzoekers:

Jasper J. van de Bovenkamp, Bachelorstudent (Creative Technology) tevens hoofdonderzoeker *- Email: j.j.vandebovenkamp@student.utwente.nl*

Randy Klaassen, Begeleider (HMI)
- *Email: r.klaassen@utwente.nl*

Praktijk Forza, client (ZGT)

- *Email: info@praktijkforza.info*

Onafhankelijk advies
Mocht u niet goed weten wat u aan moet met deze informatie en zou u graag een onafhankelijk advies ontvangen, kunt u terecht bij de secretaris van de Ethische Commissie (ethics-comm-ewi@utwente.nl). U kunt hier eventueel ook terecht voor eventuele klachten over dit onderzoek. De commissie bestaat volledig uit onafhankelijke deskundigen verbonden met de universiteit en zijn bereikbaar voor uw vragen en klachten.

A.12 – Consent form

Toestemmingsformulier “Dinner Time!”

De ontwikkeling van hulpmiddel om kinderen met autisme en hun ouders/verzorgers te ondersteunen, om de problematische eetgewoontes van het kind aan te pakken.

Om beter inzicht te krijgen over de perceptie van verschillende uitgewerkte concepten, willen wij graag een aantal vragen stellen aan de hand van een aantal gevisualiseerde concepten. Met de gegevens die wij vervolgens onttrekken uit het interview zullen wij proberen een gegronde keuze te maken voor een van de concepten, om deze vervolgens uit te gaan werken tot een prototype. Uitgebreide informatie is terug te vinden in de informatiebrochure, waar u ook contactgegevens zult vinden voor verdere vragen/opmerkingen.

- Ik ben ☐ Wel
  Niet ☐
  Voldoende geïnformeerd over het onderzoek doormiddel van de informatiebrochure. Ik ben er van op de hoogte dat ik op elk moment voor kan kiezen om mij terug te trekken uit het onderzoek, zonder dat ik hier een reden voor hoef te geven.

- Ik ben ☐ Wel
  Niet ☐
  Bereid om deel te nemen aan het onderzoek “Dinner Time!” en heb voldoende tijd gekregen te beslissen of ik mee doe.

- Ik ☐ geef Wel
  Niet ☐
  Toestemming om mijn gegevens te gebruiken in huidig onderzoek, waarna de onderzoeksresultaten op geanonimiseerde basis gepubliceerd kunnen worden.

- Ik geef ☐ toestemming Video + audio
  Audio ☐
  ☐ Niets
  Opnames te maken om de antwoorden op de vragen zo effectief mogelijk te verwerken in het onderzoek, waarna de opnames verwijderd zullen worden.

Naam van deelnemer:

Handtekening: Datum: __/__/__

Ik verklaar dat ik de deelnemer volledig heb geïnformeerd over het onderzoek en zal de deelnemer ten allen tijde in hoge waarde nemen.

Mocht er tijdens het verloop van dit onderzoek een verandering plaatsvinden die de toestemming van de deelnemer verandering brengt, wordt dit per direct gecommuniceerd naar de desbetreffende deelnemer.

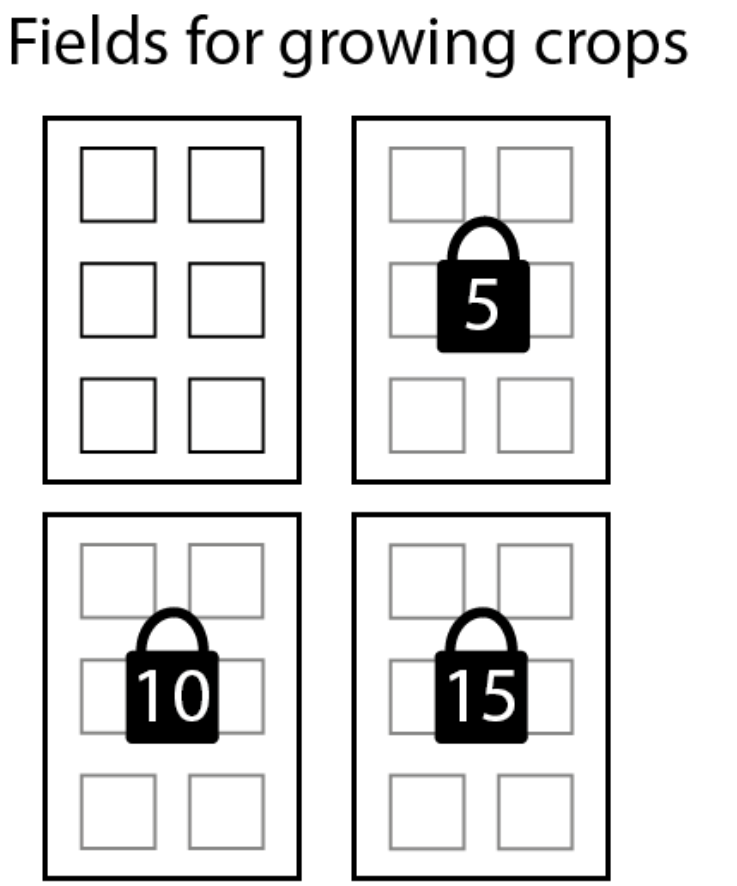
Naam van onderzoeker:

Handtekening: Datum: __/__/__

A.13 – Results of feedback sessions

		Favourite concept	Least favourite	Arguments - concept 1 - Thermometer	Arguments - concept 2 - Interactive Plate	Arguments - concept 3 - Farming game Application
Professionals		Manage your own farm App	n.a.	goals, we think that this has a motivational effect. The child can not hide from the thermometer as it is inside the room, which could be useful. We do think that this concept would become boring for the child very quickly, which would be demotivating. Maybe adding the posibilty to save progress would be a nice addition. This would enable the professionals and parents to further visiualise their strategies	The idea is playful and shows some potential as it could be modified to the needs and preferences of children quite easily. However there is some doubt regarding the age group of the children, as this concept doe seem to be a little childish. It does make the meal more enjoyable and clear, the child knows what is left to eat.	The concept of the application is not entirely original as app such as farmville exist, but adding features that are specific to this situation make it more original and creative. The concept should be worked out some more, with additional features that provide towards a higher effectiveness and playability. It is nice that the child can go back to the roots of the foods on their plate, to lean more about them.
Meeting 1		Manage your own farm App	Interactive plate	It would be motivating at first, but that might not hold for too long. If progression moves too slow frustration will occur. It is nice to be able to set your own goals, as this makes it more personal which is what you need in this case.	I do not this this would urge the child to try new foods. It would be a fun interaction which also delivers a good overview of what is left. I think my child could be motivated, but it might take too long to reach the end of the track. Which would make the clarity of progression actually counterproductive. I do think that this concept is more suitable for younger audiences.	understand how it could motivate the child. Personally i think for my child it would be a little less recognisable as he only eats pureed foods. I think it would ask some additional effort from parents, when deciding the amount of rewarding coins, maybe some tool or handbook would be needed? I think that this is a suitable concept for the target group, they would be motivated by this i think.
Meeting 2		Manage your own farm App	Thermometer	target group, as it asks more independant thinking. Maybe the concept could become more interesting when you add figures to it. I think that this concept is a little far away from the subject of food, maybe that could be integrated more? Maybe the goal should be lower than the top of the thermometer, so that children feel that they do not have to do everything, but can also overachieve.	As parent you would want to let your child eat from a normal plate, this might discourage that. I do not think having a rewards at the end is something that is very responsible or effective. It looks to childish right now, adding more interactions could help to make it less childish. It could be a nice step in between not eating and eating from a normal plate, but for younger audiences.	and effective technique to motivate children. Where the other concepts might be better for a Forza employee to bring with him/her, this is something that can easily be used by the parents. I do think that it needs some more to it, for example adding animals and pieces of furniture to decorate. It is nice that the farmer gives some adtional facts to the child, to teach something and increase familiarity.
Meeting 3		Manage your own farm App	Thermometer	It is very nice that the child can visibly work towards a certain goal. We also think that the idea of letting the child set the goals can have a motivational effect.	This idea would be more suitable for younger audiences, not the target group. But if the research were to focus on the ages, the concepts would be very promising. The posibility to make many variations to this product based on the preferences of the child is very pleasant.	This concept would fit the target group quite nicely in our opinion. I would focus on digital for older children, and something physical for yougger children. It is nice that the child can see what the foods look like, as they tend to forget. But maybe the pictures could be of real foods, instead of illustrations.
	Amount of positive/neutral/negative arguments	Positive = 5 Neutral = 3 Negatieve = 5	Positive = 4 Neutral = 1 Negative = 8	Positive = 8 Neutral = 5 Negative = 1		
	Ratio between Positive and Negative	38,5% positive, 38,5% negative	30,7% positive, 61,5% negative	57,1% positive, 7,14% negative		

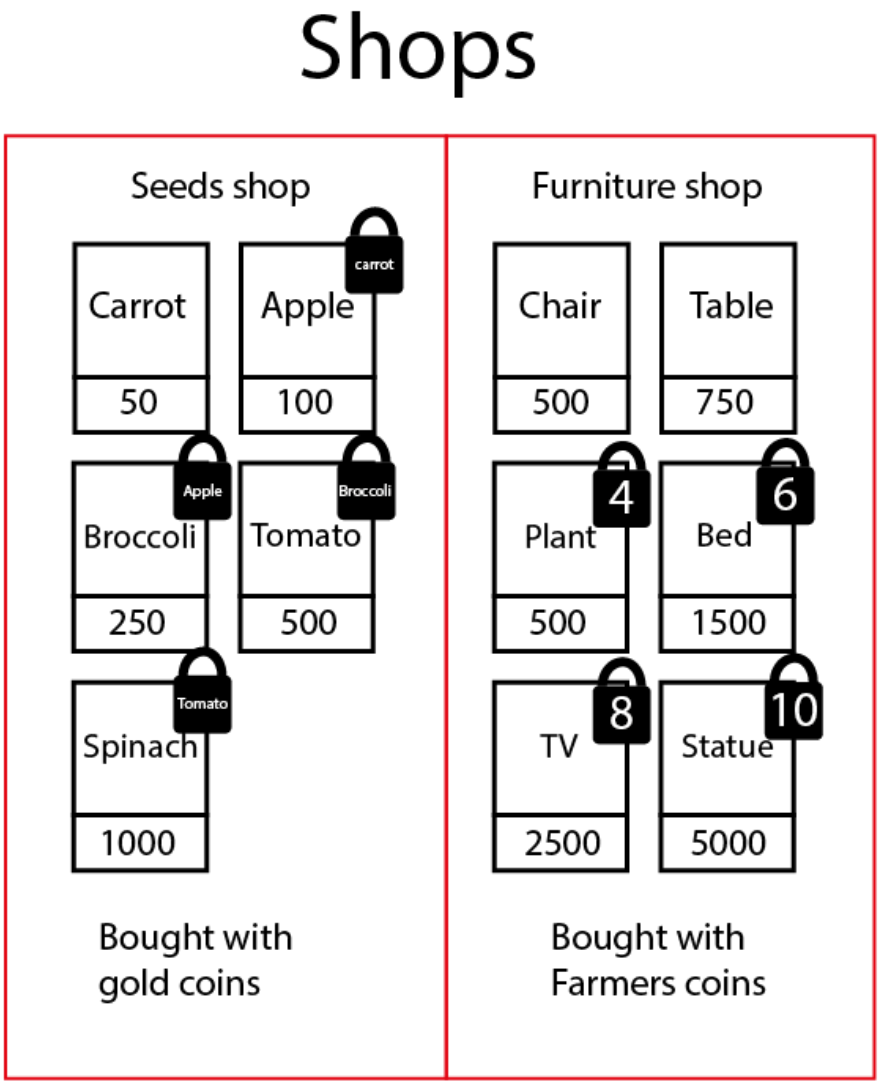
A.14 Illustration of fields (Large)



Every field will contain 6 patches of dirt where the player can plant crops. The first field is unlocked from the beginning, the others are unlocked from levels 5, 10 and 15.

Every field can contain one seed at a time, where every seed will take 1 night to fully grow into the vegetables and fruits they represent.

A.15 illustration of shops (large)



Some items in the furniture shop need to be unlocked wth certain amounts of experience points. Some seeds in the seed store are unlocked by fully growing other seeds into crops.

A.16 Questions study evaluation phase

Questions for the child

What is your age?
How much time do you spend playing videogames on your PC or tablet?

How did you enjoy playing with the application?
- Why?

How do you think that you could be motivated to try more during dinnertime when this app rewards you?

Did you encounter any difficulties during the interaction?
- If yes, what?

Were you able to find everything that you needed with ease?

Is there something that you liked very much?
- If yes, what?

Is there something that you would want to add/change?
- If yes, what?

What grade would you give the application? And why? [1-10]

Is there anything else you would like to say?

Questions for the parent

In what way do you think that this would support against eating problems for your child?

Do you think this application is safe to use for a child with autism?

Would you try to make use of this application if it were available?
- Why?

Do you have any improvements that you would like to add?

Do you have any parts that work very well in your opinion?

What is your final judgement of the application? [1-10]

DO you have anything else you would like to say?

A.17 Information brochure January 2021 (dutch)

Informatiebrochure

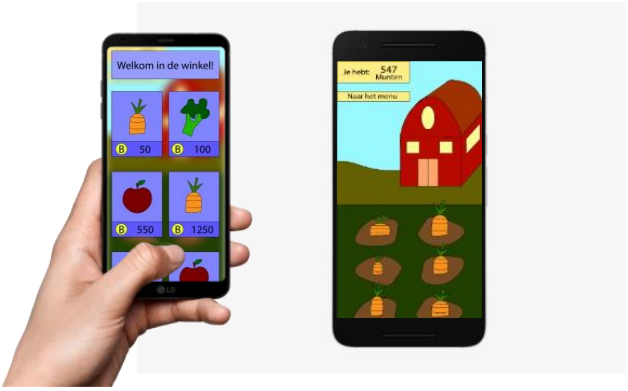
Dinner Time!

Deze brochure is bedoeld om u meer informatie te geven over het onderzoeksproject: ‘Dinner Time!’ Wij leggen in deze brochure uit wat het betekent om mee te doen aan dit onderzoek, en wat er gebeurt met de verstrekte informatie. Dit onderzoek wordt uitgevoerd in samenwerking met de Universiteit Twente en praktijk Forza, en heeft als doel om meer informatie te verkrijgen over uitgedachte concepten die kinderen met autisme en eetproblemen moeten ondersteunen.

Kinderen met autisme hebben vaker last van eetproblematiek en dit kan kwakkelen van de gezondheid met zich meebrengen. Het is daarom van groot belang om kinderen te ondersteunen om hun houding ten opzichte van het gepresenteerde voedsel veranderen. Praktijk Forza levert ondersteuning voor zowel kind als verzorger aan huis en is op zoek naar een interventie die hen kan helpen in het dagelijkse leven, wanneer de verzorgers van het Forza niet aanwezig zijn. De interventie moet de betrokken partijen (kind, ouder/verzorger, zorgverlener) een ondersteuning leveren om effectiever om te gaan met de eetproblematiek.

Voor meer vragen kunt u terecht bij Jasper J. van de Bovenkamp, waarvan de contactgegevens onder aan het document toegevoegd zijn.

Het prototype



Tijdens het onderzoek zullen wij uw kind een prototype voorleggen, en vragen om er een interactie mee aan te gaan. Het is natuurlijk erg belangrijk om te weten wat wij uw kind zullen voorleggen, daarom leggen wij graag uit hoe het prototype er uit zal zien. Een prototype is een uitwerking van een concept om goed in beeld te krijgen hoe het desbetreffende concept uitgewerkt kan worden richting een eindproduct. Het concept waarvoor wij een prototype hebben gecreëerd is gebaseerd op het beheren van een boerderij aan de hand van eetprestaties in het echte leven. Wanneer uw kind heeft gegeten tijdens het diner kunt u een specifiek aantal munten aanleveren als beloning. Hoe veel u wanneer geeft wordt duidelijk in een handleiding die meegeleverd zal worden bij het eindproduct.

Met de munten die uw kind ontvangt kan hij/zij zaadjes kopen in de applicatie, die vervolgens op het veld geplant kunnen worden. Wanneer de zaadjes volgroeid zijn kunnen deze weer voor een andere munteenheid verkocht worden aan de boer, wie ook nog een aantal leuke feitjes over het voedsel geeft. Met deze munten kunnen de kinderen leuke meubels kopen en een schuur inrichten op de manier die hun aanspreekt.

Met deze applicatie willen wij uw kind graag op een speelse manier motiveren om net een stapje verder te gaan tijdens de eetmomenten. Daarnaast willen wij uw kind graag meer bekendheid geven met bepaalde soorten voedsel aan de hand van het planten van het voedsel en de feitjes die de boer geeft. Uw kind kan via een laptop met het prototype spelen en zal niet op de app-store aanwezig zijn tijdens dit onderzoek.

Het onderzoek

Aan de hand van eerder onderzoek binnen dit project is een prototype van een applicatie tot stand gekomen die alle betrokkenen binnen de context van de situatie (ouder, kind, Forza) zou moeten helpen. Om te bekijken hoe goed dit prototype binnen de situatie past willen wij graag een onderzoek moment met uw kind inplannen. Wij zullen uw kind het prototype voorleggen en vragen om hier mee te spelen, waarna wij ook om zijn/haar mening vragen om er achter te komen hoe het prototype ontvangen wordt. Meer informatie over het prototype vind u hierboven onder het kopje: "*Het prototype*". Het doel van dit prototype is om u een beter beeld te kunnen geven over het mogelijke eindproduct zodat u en uw kind een zo goed mogelijke mening kunt vormen. Het wordt op deze manier mogelijk om zo veel mogelijk onderdelen van het prototype te begrijpen en daarnaast te zien hoe een mogelijke interactie met het eindproduct er uit zal zien.

Tijdens het onderzoek willen wij u als ouder vragen om op gepaste afstand te blijven van uw kind. Wij willen graag weten hoe uw kind op zelfstandige wijze met het prototype om gaat, waarbij geen hulp van ouders hoort. Natuurlijk mag u als ouder altijd in de buurt blijven en zullen wij, wanneer wij dit nodig achten, om uw ondersteuning vragen. Het is niet ons doel om uw kind in een stressvolle situatie te betrekken, integendeel, dus wij zullen er alles aan doen om uw kind op zijn/haar gemak te brengen. Daar willen wij aan toevoegen dat u als ouder weet wat het beste is voor uw kind, dus mocht u merken dat uw hulp nodig is zullen wij u nooit tegenhouden.

Zoals eerder benoemd zullen wij uw kind vragen om een interactie aan te gaan met een prototype. Uw kind zal meermaals een doel krijgen, maar krijgt ook de vrijheid om zichzelf te oriënteren binnen de applicatie. Een dergelijk doel zou bijvoorbeeld kunnen zijn: kun jij een zaadje kopen in de winkel en deze planten?; kun je mij aanwijzen waar je de schuur vindt, en hoe je er binnen komt?. Uw kind zal 1 doel tegelijk krijgen om er zo voor te zorgen dat alles overzichtelijk en haalbaar blijft.

Terwijl uw kind met de applicatie bezig is proberen wij goed op het gedrag te letten, maar wij zullen ons op de het prototype focussen en niet op het specifieke gedrag van uw kind. Ter verduidelijking een voorbeeld: Wij vinden het interessant om te weten hoe lang het duurt voordat het gemiddelde kind de winkel vindt waar de zaadjes gekocht kunnen worden, niet hoe lang uw kind er in het specifiek over doet. Wij zullen geen druk op uw kind uitoefenen en dus voldoende tijd geven om een interactie met het prototype aan te gaan. Daarnaast zullen wij nooit een diagnose stellen over het gedrag van uw kind gezien wij geen professionals binnen dat vakgebied zijn.

Na de interactie met het prototype stellen wij uw kind graag nog een aantal vragen over zijn/haar perceptie van de applicatie. De antwoorden die uw kind hier op geeft kunnen wij goed gebruiken om een onderbouwing te vormen van de interactie met het prototype. Wij zullen er alles aan doen om de vragen zo gemakkelijk mogelijk te maken voor uw kind zodat hij/zij begrijpt wat er gevraagd wordt. Mocht het voorkomen dat uw kind er niet uit komt is het altijd mogelijk om een vraag over te slaan, of hulp te gebruiken van u als ouder. U en uw kind zijn ten allen tijde in het recht om aanspraak te maken op het feit dat u vragen over mag slaan of volledig uit het interview te stappen. Wij zullen er alles aan doen om er voor te zorgen dat de vragen volledig gebaseerd zijn op het prototype zelf, en niet de specifieke situatie van u en uw kind.

Deelnemen aan dit onderzoek is ten alle tijden vrijwillig en zal ongeveer 45 minuten in beslag nemen. Het is op elk moment mogelijk om zonder het geven van een reden uit het onderzoek te stappen, tot 72 uur na het plaatvinden van de interactie.

De locatie van het onderzoek
Het onderzoek zal gezien de huidige coronamaatregelen plaatsvinden door middel van een videoverbinding, hiervoor gebruiken wij Microsoft Teams als medium. Wij nemen het gesprek graag op zodat wij uw antwoorden op een later moment op correcte wijze kunnen verwerken. Op deze manier hopen wij de kwaliteit van het interview hoog te houden, gezien wij onze onverdeelde aandacht aan uw antwoorden kunnen schenken. Het is ook altijd mogelijk om aan te geven dat slechts audio op mag worden genomen of om zelfs geen opnames te maken. Meer informatie over de verwerking van de videobeelden kunt u verder in dit document vinden, onder het kopje *“(video) opnames*”.

Gegevens
De verstrekte gegevens worden gebruikt om wetenschappelijk onderzoek uit te voeren, een afstudeeropdracht van de Universiteit Twente in het specifiek. Het is mogelijk dat dit onderzoek openlijk gepubliceerd zal worden op het internet en media. Dit maakt het ook mogelijk dat toekomstige onderzoeker of ondernemer gebruik zal maken van de verstrekte resultaten, hier zullen ten allen tijde anonieme resultaten afgebeeld worden. Het zal daarom nooit mogelijk zijn dat persoonlijke informatie van uw kind terug te vinden is in de verwerkte resultaten. De gegevens waar wij hier over spreken zijn samenvattingen van de antwoorden die uw kind op de gestelde vragen heeft gegeven. Wij zullen deze samenvatten door mogelijke persoonlijke onderdelen van uw kind te verwijderen, en slechts de essentie van de interactie te gebruiken.

(Video) opnames
Om er voor te kunnen zorgen dat wij een effectief onderzoek met uw kind kunnen houden en na dit onderzoek de informatie goed te kunnen verwerken, maken wij graag een opname van dit moment. Wij zullen er alles aan doen om de privacy van uw kind volledig te respecteren, en zullen daarom netjes omgaan met de videopnames. Wij zullen de resultaten op anonieme basis uit de videobestanden ontnemen, en deze vervolgens verwijderen. Het zal dus onmogelijk zijn om uw kind te herkennen in de uiteindelijke onderzoeksresultaten. De onderzoeksgegevens worden volgens de VSNU richtlijnen 10 jaar lang bewaard.

Toegang van gegevens
De gegevens die wij verzamelen zullen ten alle tijden alleen toegankelijk zijn voor de onderzoekers die onderaan deze brochure vermeldt staan. De plaatsgevonden interactie en de antwoorden op de gestelde vragen zullen geanonimiseerd worden en verwerkt worden door de onderzoekers waarna deze per direct verwijderd worden. De gegevens zullen dus nooit publiek worden gemaakt of voor promotionele doeleinden worden gebruikt. Uitzondering treedt op wanneer de desbetreffende deelnemer zelf anders aangeeft.

Terugtrekken van gegevens
Zoals eerder vermeld is het mogelijk om uw kind tot 72 uur na de oorspronkelijke interactie terug te trekken uit het onderzoek, waarmee alle gegevens per direct verwijderd zullen worden zonder enige tegenspraak. Wanneer deze 72 verstreken zijn zullen de onderzoeksresultaten verwerkt worden in het onderzoek en is het niet meer mogelijk om deze terug te trekken.

Contact

Mocht u graag contact met ons opnemen over deze informatiebrochure en het verdere onderzoek kunt u contact opnemen met de volgende onderzoekers:

Jasper J. van de Bovenkamp, Bachelorstudent (Creative Technology) tevens hoofdonderzoeker

- *Email: j.j.vandebovenkamp@student.utwente.nl*

Randy Klaassen, Begeleider (HMI)

- *Email: r.klaassen@utwente.nl*

Praktijk Forza, client (ZGT)

- *Email: info@praktijkforza.info*

Onafhankelijk advies

Mocht u niet goed weten wat u aan moet met deze informatie en zou u graag een onafhankelijk advies ontvangen, kunt u terecht bij de secretaris van de Ethische Commissie (ethics-comm-eemcs@utwente.nl). U kunt hier eventueel ook terecht voor eventuele klachten over dit onderzoek. De commissie bestaat volledig uit onafhankelijke deskundigen verbonden met de universiteit en zijn bereikbaar voor uw vragen en klachten.

A.18 Consent form January 2021

Toestemmingsformulier “Dinner Time!”

De ontwikkeling van hulpmiddel om kinderen met autisme en hun ouders/verzorgers te ondersteunen, om de problematische eetgewoontes van het kind aan te pakken.

Om beter inzicht te krijgen over de gebruikerservaringen van een prototype, willen wij uw zoon/dochter vragen om met een applicatie te spelen waarna wij een aantal vragen stellen aan de hand van deze interactie. Met de gegevens die wij vervolgens onttrekken uit dit onderzoek zullen wij proberen een gegronde conclusie trekken over de waarde van het huidige prototype, zodat deze verder uitgewerkt kan worden naar een eindproduct. Uitgebreide informatie is terug te vinden in de informatiebrochure, waar u ook contactgegevens zult vinden voor verdere vragen/opmerkingen.

- Ik ben ☐ Wel
  ☐ Niet

  Voldoende geïnformeerd over het onderzoek doormiddel van de informatiebrochure. Ik ben er van op de hoogte dat ik op elk moment voor kan kiezen om mij of mijn kind terug te trekken uit het onderzoek, zonder dat ik hier een reden voor hoef te geven.

- Ik geef ☐ Wel
  ☐ Niet

  Toestemming om mijn gegevens te gebruiken in huidig onderzoek, waarna de onderzoeksresultaten op geanonimiseerde basis gepubliceerd kunnen worden.

- Ik geef ☐ Wel
  ☐ Niet

  Toestemming om mijn kind te betrekken in het onderzoek volgens de lijnen die gepresenteerd zijn in de informatiebrochure. Mijn kind is voldoende gemotiveerd en geïnformeerd om deel te nemen.

- Ik geef toestemming ☐ Video + audio
  ☐ Audio
  ☐ Geen

  Opnames te maken om het onderzoek zo effectief mogelijk te verwerken, waarna de opnames verwijderd zullen worden.

Naam van deelnemer:

Handtekening: Datum: __/__/__

Ik verklaar dat ik de deelnemer volledig heb geïnformeerd over het onderzoek en zal de deelnemer ten allen tijde in hoge waarde nemen.

Mocht er tijdens het verloop van dit onderzoek een verandering plaatsvinden die de toestemming van de deelnemer verandering brengt, wordt dit per direct gecommuniceerd naar de desbetreffende deelnemer.

Naam van onderzoeker: Jasper van de Bovenkamp

Handtekening: 

Datum: 29/12/2020

Contact
Mocht u graag contact met ons opnemen over dit formulier en het verdere onderzoek kunt u contact opnemen met de volgende onderzoeker:

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