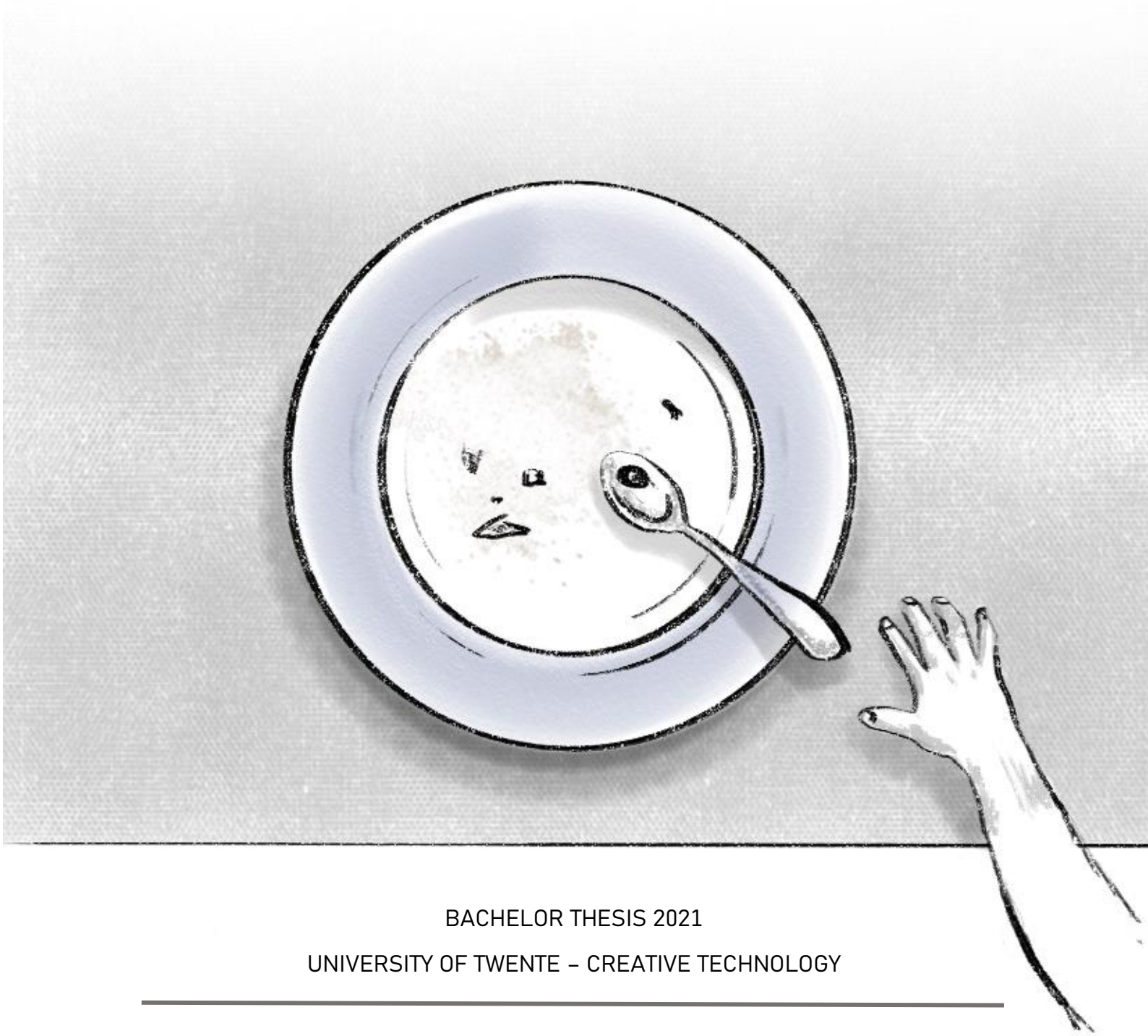
AUTISM & DINNER TIME

IMPROVING THE EATING BEHAVIOUR OF CHILDREN WITH AUTISM SPECTRUM DISORDER THROUGH PLAY



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Abstract

Children with Autism Spectrum Disorder (ASD) often experience appetite inhibition, tactile sensitivity and have an atypical response to taste. This leads to difficulty with eating foods, especially vegetables. If this is not changed in childhood diets will stay unchanged into adulthood and they do not receive the necessary nutrients. Mealtimes also cause stressful situations for parents. To combat this problem, gamification, playification and technology are used to design a product that can help change this behaviour with the help of known behaviour change interventions. The Creative Technology Design process was used to design such a product: ideation, specification, realisation and evaluation. A board game and a plate with coloured sections were designed to help solve this. The coloured sections on the plate correspond to the coloured section on the board. When the child lands on a coloured section of the board game, they must eat a teaspoon from the corresponding colour of the plate. If this is successful, the child may watch a small animation. The animation is used as a motivator to eat. The product presents a possibility to implement gamification, playification and technology to change the eating behaviour of children with ASD.

Contents

1. Introduction

Children with Autism Spectrum Disorder (ASD) often have difficulty eating food. This concerns rigid eating habits, resistance to try new foods, sensory abnormalities, or appetite inhibition [1]. This causes countless problems for the children as well as the parents and guardians.

Many methods have been created and tested to improve the eating behaviour of children with ASD. At present, there are limited solutions implementing gamification, playification, toyification and technology in helping these children. There are also very limited approaches to helping guardians or parents implement the methods and training programs to support them.

The goal of this thesis is to evaluate the potential for supportive technology to known training methods regarding the eating behaviour of children with ASD. The main research question is: How can gamification, playification, or/and technology be used to change the eating behaviour of children with Autism Spectrum Disorder?

Children regularly experience a food refusal phase [2]. The difference between autistic children and typically developing children is that repeated exposure to a particular food is not effective. If this food selectivity is not alternated, the diet of the child remains unchanged through adulthood. Autistic children, therefore, have a significantly lower intake of necessary nutritional substances such as calcium, protein, and vitamin C [3]. Not only is eating a struggle for the child but the parents or guardians can experience high-stress situations at mealtimes as well [4]. When adopting a solution for children with ASD, the parents or guardian's role should also be considered.

Since successful interventions already exist, improving a known intervention is more achievable, than creating a whole new method. One successful training program is the "Teaspoon" method which was developed at the ZGT hospital in the Netherlands [4]. The basic notion of the teaspoon method is that eating is a normal practice and that there is no need for the child to receive rewards for eating. If the child does not eat the required portion (teaspoons) of food, an avoidance situation will be implemented, for example going to bed early. The preference to eat the food and not be sent to bed is then higher. If this were subsequently successful in changing the behaviour of the child, the number of teaspoons of the child's rejected foods would be increased over a certain period. The training of the behaviour change intervention would be given to parents or guardians via a paediatrician [4].

Gamification, playification and toyification are upcoming concepts, which are being enforced in an increasing number of applications. Gamification refers to the use of game mechanics such as points and badges to motivate the change of one's behaviour, to encourage innovation or develop skills[5]. An important concept of gamification is the application of game elements in a non-game context [6]. Playification refers to the 'playful' use of game elements in a less competitive way. Toyification is the idea of changing the appearance, function, or form of the food in a 'toyish' (or childish) manner [5].

Using game-like learning in combination with digital technologies is a viable method for many disciplines [7]. Gamification/playification and technology show a lot of potentials when combined with these interventions, however, more research still needs to be done. The use of technology to assist psychological processes is otherwise known as supportive technology. Supportive technology can be used to enhance a current intervention and make the implementation of the intervention easier. Currently, certain 'picky eating' application and marker-based augmented reality has been used. This supportive technology could help dozens of parents and guardians guide their children towards better eating habits. For the children, it could advance their eating behaviour and make it a more enjoyable experience.

The methodology which will be used to create a technological implementation is the creative technology design process. It consists of four main stages: Ideation, specification, realization, and evaluation [8].

This thesis will be divided into eight chapters: Chapter 2 contains background research and state of the art. Chapter 3 will present the ideation phase of the project. Chapter 4 will detail the design

choices concerning the chosen product. Chapter 5 will show the realization of the prototype. Chapter 6 will discuss the evaluation of the product. Chapter 7 will include the discussion, limitations and future research. Finally, chapter 8 contains the conclusion.

1.1 Research Questions

The main research Question is: How can gamification, playification, or/and technology be used to change the eating behaviour of children with Autism Spectrum Disorder?

1.1.1 Sub Questions

1. What are common problems autistic children face concerning their eating behaviour?
2. What behavioural approaches are used concerning children with ASD?
3. What interventions concerning the eating behaviour of children with ASD are used?
4. What are current products related to Autism, eating and/or children?

1.2 The Scope of the Project

This project will focus on developing a product for children with ASD. Within this project, the target group chosen is 4- to 6-year-olds. This is about the age where typically developing children learn to read and write. This age group has been chosen because many current interventions or applications focus on ages six and up, therefore there is more benefit for a product made for this age group. Besides this, this age group can count, recognise shapes, and understand basic game mechanics. There are therefore more design possibilities for the final product.

In this graduation project there are a few terms that are consistently used and may need to be clarified:

- Product: The product refers to the game/design which is developed in this project.
- Intervention: Intervention refers to a behavioural change method that is used to change the eating behaviour of children with ASD. Which intervention the word refers to, differs to the context.

2. Background

2.1 Introduction

Food refusal, food selectivity or high-frequency single food intake are all aspects of the eating behaviour of children with ASD [1]. Many interventions and behavioural approaches relating to children with autism have been developed. The interventions that are currently known are not always appropriate or effective [1]. By researching which current interventions are used to change the eating behaviour of autistic children, novel combinations of the interventions could create a breakthrough. Common, problems concerning the eating behaviour of autistic children will be addressed first. Secondly, certain behavioural approaches will be summarized, before noting relevant interventions these behavioural approaches have been applied to.

Studies included in this review were based on Children with Autism Spectrum Disorder with an age range from one-year-olds to 14-year-olds. Most of the articles chosen were based on eating and diets related to children with ASD, although several were added about additional theories and approaches. Sections from this background chapter have been taken from a literature review done on the same topic which can be found in Appendix A: Literature review.

2.2 Difference in Eating Behaviour between Autistic Children and Typically Developing Children

The difference in eating behaviour between TD children and children with ASD is important to define. **Food selectivity** is the most prominent difference. This food selectivity in children with ASD can include limited food repertoire, food refusal and restricting food intake to a few frequently eaten foods [9]. Vegetables are most consistently rejected by children on the spectrum, compared to TD children [9]. Food selectivity is often based on the sensory aspects of the food. Autistic children essentially selected low textured foods or foods that had been pureed [10]. Refusal to eat certain foods is typically related to foods that required a great deal of chewing. This is allegedly due to the developmental delay in tactile sensitivity, sensory-motor functions, and an atypical response to taste in children with ASD [9]. This makes their choice of preferred foods limited, and therefore difficult to accommodate. Children with ASD additionally do not perceive visual and auditory information similarly to typically developed children [11]. Children with ASD often did not like foods **physically touching** each other [9]. Foods would also be rejected due to temperature, texture, taste, and smell [11]. Besides the sensory aspects, the food often had to be **prepared in a certain way,** for example, only eating fried foods [10], [12]. High-frequency single food intake (HFSFS) is often noted as an aspect of ASD however Bandini et al. [9] acclaimed that HFSFS has rarely been tested in TD children. Other aspects of children with Autism are that they often have no intrinsic **motivation to eat** and often have appetite inhibition [13]. This means that the children do not recognise the feeling of hunger [4].

Besides actual eating behaviour, mealtimes can be particularly stressful for guardians or parents. Handayani et al. [10] stated that children with autism are more aggressive during mealtimes. They have difficulty remaining seated till the end of the meal and find it challenging to deal with the flexibility of the mealtime routine [10]. Behavioural approaches and interventions are therefore often made with the caregivers in mind.

2.2.1 Conclusion

Food selectivity, appetite inhibition, intrinsic motivation to eat, food proximity and means of preparation appear to be the main differences between the eating behaviour of children with ASD and TD children. Behavioural approaches can be more easily understood when characteristics of the eating behaviour of children with ASD are also considered.

2.3 Current Behavioural Approaches to help Autistic Children

There are several types of behavioural approaches concerning the eating behaviour of autistic children. Firstly, Turner et al. [1] make the distinction between intrusive and non-intrusive methods.

Two intrusive methods which are mentioned are **Non-removal of the spoon** (NRS) and **representation of expelled foods** (RP), these methods are mostly used together. NRS is when a quantity of food is held near a child's mouth and not removed until swallowed. Representation of expelled foods consists of re-serving foods which have previously been rejected. These methods are named as part of 'escape extinction': caregivers persist in re-presenting the food until the child has eaten it [1]. Both Van der Gaag & Snijders [4] and Turner et al. [1] reference Piazza et al. [14] when mentioning escape extinction. Najdowski et al. [15] determined that escape served as negative reinforcement and suggest in contrast to Piazza et al. [14] that inappropriate mealtime behaviour is encouraged with negative reinforcement. This is noted to be due to unintended use of positive adult attention and supports the functional analysis of Piazza et al. [14] in producing false-positive results [15].

Positive approaches were also tested. Van der Gaag & Snijders [4] mention the benefit of using both **positive** and **negative reinforcement**. Positive reinforcement is when a reward is presented after the preferred behaviour is accomplished, this increases the likelihood of the action happening again. Negative reinforcement works by removing an unpleasant future event after the desired behaviour is shown [4]. Escape extinction does not seem to be an effective behavioural approach, where the use of positive and negative reinforcement does.

Applied Behaviour Analysis (ABA) technique is a teaching tool based on positive reinforcement. It follows the principle that the desired behaviour is more likely to be repeated with the promise of reward, alongside a repetitive training process. This idea was formed by the theory of Lovaas [16] where reinforcement is the key aspect of the treatment. In this research, it was stated that high rates of aggression should be ignored in a child, as this should reduce the aggression shown [16]. The ABA method is split into three steps: (1) the target task is instructed to the child, (2) the response of the child is monitored, (3) the child's behaviour is rewarded, or the child is prompted when necessary. The ABA technique focuses on teaching children with ASD about new objects or pictures which correspond to a word [17]. For example, asking children to select a picture card of a carrot to the word. Even though the ABA method is not directly correlated to the eating behaviour of autistic children, it can be implemented as an eating-related learning technique.

Another technique is the Picture Exchange Communication System (PECS). PECS is in many ways like the ABA technique. PECS uses pictures and symbols to encourage Autistic Children to speak. Children start with an introduction of non-verbal symbols and in later stages are introduced with verbal symbols, encouraging them to speak [18]. Both PECS and ABA are based on the fact that children with ASD are visual thinkers and therefore are more likely to remember and learn through pictures.

Another behavioural approach that has been implemented in eating behaviour interventions is the Mobile Object Identification System (Mobis). Children with ASD often have difficulty keeping attention and take longer to do a simple task [17]. The basic concept of Mobis is therefore that the focus of the child will be held by breaking down the task into smaller components, this is done with the use of augmented reality [19]. Different tasks are then presented in 'bite-size' pieces with corresponding images.

Lastly, Response Shaping is a behavioural approach that seems to connect the previously mentioned behavioural approaches. Response Shaping refers to the process where the target behaviour is reached by continuously adjusting the procedure slightly while the stimulus or reward remains the same [1], [20], [21]. Response Shaping uses both positive reinforcement and the repetitive and monitoring aspects of the ABA method but does not make use of escape extinction. The key to using the above-mentioned behavioural approaches correctly is monitoring and adjusting. Rewards are adapted, when they are not effective, and approaches are changed. How these approaches have been adapted depends on the success of their implementation.

2.3.1 Conclusion

By summarizing the before mentioned behavioural approaches, some aspects have been noticed which could be of importance. The importance of these aspects might be subjective. Firstly, inappropriate mealtime behaviour is often caused by the unintended use of positive adult attention. For example, the use of verbal praise at a moment when the child is spitting out their food. The use of

unintended rewards should be recognized when developing a product.
Secondly, repetition is a key part of changing behaviour. Finding a way to create repetition while keeping the product interesting is important. There is a preference for using non-intrusive methods when it comes to the eating behaviour of children with ASD. The combined use of positive and negative reinforcement seems to give the best results. How positive and negative reinforcement is implemented should be observed. It is also important to monitor a child's response and by doing so adjusting either the rewards or method. Maybe the elements of the product should be interchangeable for this reason. Children with ASD are visual thinkers, so the setup of the product is important. This can concern aesthetics as well as the possible use of visual illusions. Mobis makes use of breaking down a task into smaller components. This could also be implemented in an eating behaviour product.

2.4 State of the Art

The following interventions have been chosen in their relation to food and autistic children. They all use some of the behavioural approaches mentioned above and try to improve certain aspects of a child with ASD's daily life. The use of positive and negative reinforcement, physical food transformation, response shaping, applications and the use of augmented reality will be addressed. Products that help tackle sensory overload and food exposure will also be mentioned.

2.4.1 Positive and Negative Reinforcement

The teaspoon method is an implementation of both positive and negative reinforcement with the basic notion that eating is the normal practice [4]. The teaspoon training program starts by presenting the child with one teaspoon of avoidance food. By making the eating threshold low, the child is more likely to accept the food. If they do not, an avoidance situation was used as negative reinforcement, such as going to bed early. Every month the parents had a separate training session with a general paediatrician. If the child were successful in eating the teaspoon of food, the amount of food eaten would be increased. It was important for the child to see the paediatrician as the responsible party, causing the conflict between parent and child to decrease. If the child failed, the avoidance situation was changed [4]. Vaz et al. [22] tested the use of negative reinforcement by feeding the child a 'rejected' food if they did not eat the target food by themselves. This created the perception that the target food was a superior choice and the acceptance rates of eating the target food improved [22]. Van der Gaag & Snijders [4] combined positive and negative reinforcement even though positive reinforcement alone delivered negative results. The use of positive reinforcement was used by then feeding the child, a piece of their preferred food after eating the target food. In this pilot study, the use of positive and negative reinforcement was successful in changing the eating behaviour of autistic children. This intervention can be implemented by parents or guardians even though it takes some training and persistence. The Teaspoon method appears to be the first intervention of its kind implementing both positive and negative reinforcement in changing the eating behaviour of children with ASD.

2.4.2 Physical food transformations

Another implementation is the use of physical food transformation with a focus on the sensory-motor functions of autistic children. Kim et al. [23] researched the influence of vegetable exposure on the eating behaviour of children with ASD. Over six months, pre-schoolers participated in 'craft' activities involving vegetables. Results showed a significant increase in the exposure group in consumption and touch compared to the control group [23]. The idea of improving vegetable and fruit exposure in a 'playful' way was further researched by Chung et al. [11]. Chung et al. [11] performed a study where fruits and vegetables were transformed to enhance the sensory approval of autistic children. Previous studies determined a relationship between the eating behaviour and sensory processing of children with ASD [24], [25]. The physical appearance of food samples was altered, which may also have changed the temperature and texture of the foods [11]. After a month of eating the same foods in a different appearance, the acceptance rate of the previously rejected food increased. The modifications to the food influenced the tactile, smell and taste sensitivity of children with ASD due to neurological changes. The increased exposure of the same food in a preferred transformation increased the acceptance and future consumption of fruits and vegetables. These foods were often transformed into crisps, as the crunchy texture was more appealing [11]. Some possible products

which could be implemented at home to create physical food transformations can be found under physical food transformations in Appendix B.

Changing the physical appearance of food samples seems to be a novel method of increasing food exposure and therefore changing eating behaviours. In contrast to Chung et al.'s [11] goal to increase the food range preferences of the child, Yamane et al. [26] only analysed them. Yamane et al. [26] examined how to support children with ASD in the types of foods served. They characterized how a child selected their food and then separated the children into three groups. The first group was identified by touch and texture, the second group selected foods based on visual factors and the third group mostly chose familiar foods. The study focused on changing their lunchtime diets over three years, by finding recipes and foods corresponding to their preferences but with a slight adjustment. By analysing their eating habits optimal support strategies could be selected. Support strategies included preparing foods that the child prefers while cultivating the child's curiosity to try new foods by touching or licking them. Yamane et al. [26] monitored the child's behaviour to find food options that most corresponded to their liking. It was also noted that using the assistance of friends in supporting the child's cognitive and social development, their eating behaviour improved [26]. It is important to note that, Yamane et al. [26] does not actually improve the food range, and this can therefore not be classified as behavioural change implementation. However, the importance of analysing and monitoring the child's preferred eating behaviour and how this can be integrated into other interventions is important.

In the third implementation, the use of Response Shaping when monitoring the child's eating behaviour is a key part. Hodges et al. [20] presented avoidance foods to two participants sequentially. The next food was not tried till mastery of the previous food was accepted. After each successful bite, a reward was received [20]. In contrast, Penrod et al. [21] presented avoidance foods simultaneously. Neither of the two studies was noted as more effective than the other. Turner et al. [1] continued this research by comparing the use of a small food set with a large food set. In the small food set, the same three types of food were presented and with the large food set a total of 15 foods were presented (switching between different foods per session). Before the target behaviour of eating was attempted, the target behaviour was either touch or licking. This created a familiarity with the food. If the participant followed the instructions within the allocated time, verbal praise would be given, and their reward would be received. If they did not follow the objective the researcher would pick up the food and show what the objective was, for instance, by touching the food to the participant's hand or tongue. The child would then again receive social praise [1]. The way Response Shaping was used by Turner et al. [1] achieved a much shorter amount of time to complete behaviour change goals than Hodges et al. [20] and Penrod et al. [21]. In summary, the use of small or large food sets and presenting food simultaneously or sequentially does not seem to make much difference in changing behaviour. However, using sub-goals like touching or licking and positive reinforcement does. Using physical food transformation as well as touching or licking foods is a beneficial way of increasing food exposure. Thereby using positive and negative reinforcement while monitoring the child's eating behaviour seems to be a key part of successfully changing eating habits.

2.4.3 Augmented reality

Augmented reality (AR) is being used increasingly more. Two studies have been included relating to the use of AR in autism interventions. A study was conducted done by Bouaziz et al. [19] concerning the use of augmented reality to teach autistic eating skills. Flashcards which are often used in teaching skills were now used to portray 3D animations via a mobile device. When a scanned flashcard is shown on the device, the animation is played with a corresponding sound. The idea is that interactive cards should further attract the attention of the child since children with ASD are visual thinkers. The use of marker-based augmented reality on mobile devices has the benefit of ease for teachers and caretakers [19].

A separate study used augmented reality integrated with the ABA method to teach autistic children the names of objects. Although this study is not about eating behaviour, it is worth mentioning the use of augmented reality in teaching children with ASD. A projector projects a set of images on a working table and verbally instructs the child to hover their hands over the image it is associated with. If the

correct answer is given, they are rewarded with verbal praise or by playing their favourite music and otherwise the answer is prompted [17].

Using animated flashcards and images is a useful method to engage children. These ideas focus on addressing the attention span of autistic children by using technology. The basis of the ABA method can also be found in both applications. Positive reinforcement is additionally seen using verbal rewards or sounds.

2.4.4 Sensory Overload

An important part of eating difficulties in children with ASD is due to sensory overload. Here follow some tools (see Appendix B, sensory overload) used to improve sensory overload and thus improve eating [11]. Auditory perception is most regularly improved using headphones. This can be in the form of sound-proof headphones as an effective option for decreasing sound overload. For tactile input, chew toys and gloves are mentioned. Non-latex children's gloves are used when they are touching foods. Chew toys can help to improve the taste barriers. Using a weighted blanket or stuffed animal were also mentioned to provide comfort during mealtimes [27]. These products have been mentioned on several Autism blogs by parents. Although these are not scientific papers, the use of these products has proven effective to dozens of families. Many children with ASD dislike different foods touching each other [11]. Several types of food separators can be used to help this (see Appendix B, food dividers).

Cueing mealtimes is recommended to prepare a child for eating. Some mentioned methods to prepare dinner time is playing music, using fidget toys or other sensory activities.

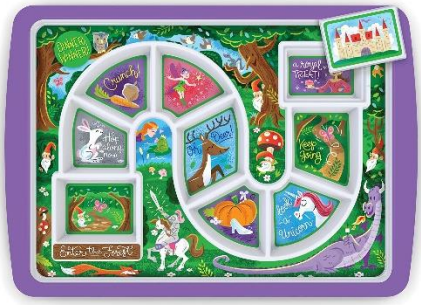
2.4.5 Food Exposure

Touching, licking, hearing, and tasting are important parts of increasing food exposure. Increasing interaction with foods can improve eating behaviour [28]. Exposure to food in food experiences such as gardening or cooking may increase the eating enjoyment of children [29]. Although Van der Horst [29] came to this conclusion based on a TD child's eating habits, similar recommendations have been made by autism nutritional experts. Morris et al. [30] held a pilot study letting 6- to 9-year-old children plant vegetables in a garden [30]. Results found that children who helped in the garden were more likely to taste different vegetables. Methods mentioned which help children with ASD increase food exposure are tearing herbs, pressing buttons on cooking machines such as blenders, planting foods and playing with new foods [31]. Products that were recommended were an indoor herb garden and using cooking utensils (see appendix B, physical food transformation) to make foods look more interesting. Several families mentioned that the eating behaviour of their child with ASD improved after observing a typically developed sibling eat the food. Siblings were used as pro-social examples and, in some cases, filmed eating certain foods, to be shown later to the child with ASD [31]. The downside of these family dynamics is that typically developing siblings are also at risk of acquiring negative eating behaviours from copying their autistic sibling.

2.4.5 Playful Plates

There are several dinner plates made for children who experience picky eating (see Appendix B, playful plates). These plates make use of playful dinner interaction and in some cases gamification. One method which is used to encourage eating is covering the plate with colourful images. This succeeds as a motivation to eat the food and discover what image lays underneath. The Food Face Dinner Plate (figure 1) makes the mealtime look appealing by adding facial attributes with the food to the painted face on the plate. A second method used is giving the child the idea that they have choices in the 'eating game' when in fact it does not matter much. This is done by either rolling dice or spinning a wheel which determines which food the child should eat. Playte Adventure [ref] (figure 2) and the Dinner Winner Tray (figure 3) both make use of a map or trail of food the child should eat to reach the goal. Playte Adventure – Feed the Crocodile uses a reward of giving away a piece of food if the player completes a game circle. A third method is the use of social play. This is only used in one product example, but maybe helpful to note anyways. Playte together (figure 4) uses a map where two people compete against the other to reach the goal. Social play has been seen to have positive effects on the eating behaviour of children with ASD [31]. The Constructive Eating Plate uses physical

boundaries to keep foods from touching each other. Even though many of the other plate products incorporate the separating of food, the Constructive Eating plate (figure 5) is the only example where physical boundaries are used. A fourth method that is implemented is the playful use of moving food with utensils. The Constructive Eating Plate does this with a ramp where food can be pushed up and onto a spoon. Having a goal in combination with game choices, social play, food separation, playful eating and colourful images seem to be successful contributions to eating behaviour.



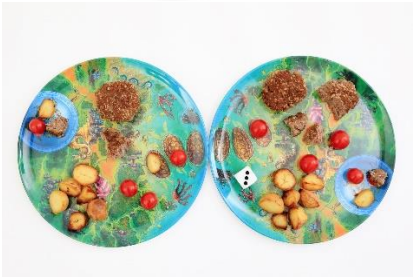
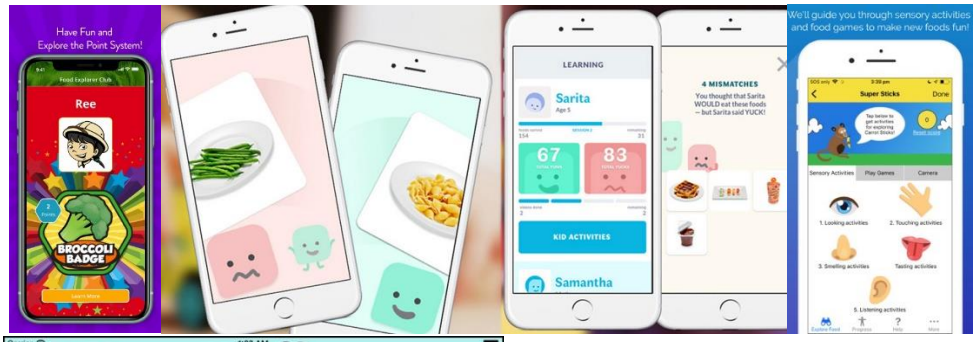


Figure 1: Food Face Dinner Plate with food
Figure 2: Playte Adventure (three variations of a game dinner plate)
Figure 3: Fred's Dinner Winner Dinner Tray
Figure 4: Playte Together
Figure 5: Constructive Eating Plate and Placemat

2.4.6 Applications

There are already some applications on the market focusing on improving selective eating habits, ARFID and other food phobias (see Appendix B, Applications). The target group is not specifically children with Autism but targets all children and parents struggling with picky eating. The majority of these applications are for a target group between ages 3 and 6. Some applications have been included in the review which does not target selective eating habits but are made for people with ASD. These have been included as a reference.

Gamification in the form of rewards is used in several different ways: in-game coins, badges (figure 6), customizable avatars, and real-life rewards chosen by parents. These rewards are received after eating successfully or trying new foods and can include long and short-term goals. Nearly all applications are made for parental assistance. They focus on informing the parents in different ways about their child's eating behaviour. When to Wonder (figure 7) uses a tinder-style method to show parents which foods their children dislike and like. Learn Play Eat (figure 8) teaches parents food exposure methods and activities to improve their child's eating behaviour outside of mealtimes. These activities are often food-related games. Kids Food Adventure (Appendix B, Kids Food Adventure) focuses on informing children about the health benefits of foods. It is also noteworthy that a mascot (figure 9) is often used in supporting the child's eating journey. This could be due to the idea of social support from a figure. There is not much use of progress in many of the apps except for receiving more rewards. This could be something to be focused on.



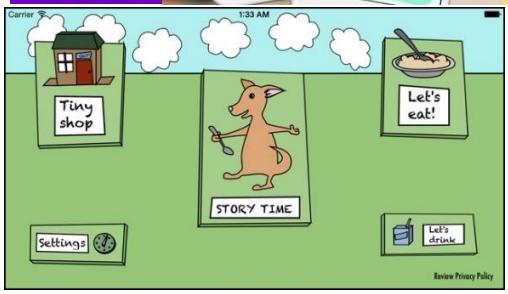


Figure 6: Food Explorer Club (receive badges)
Figure 7: When to Wonder: Picky Eating application
Figure 8: Learn Play Eat application
Figure 9: Tiny Tastes application with a kangaroo mascot

2.5 Conclusion

The teaspoon method makes use of several details which could be useful implementing in a product. Firstly, Van der Gaag & Snijders [4] use a teaspoon of food to persuade the child to eat. This works because to the child it does not look like a lot of food. Making a task look smaller than it is, would be beneficial. Secondly, the teaspoon method is introduced by a general paediatrician to reduce the conflict between children and parents. This could also be used when creating a support method for the parents. Thirdly, it has been noted that food consumption is improved by playfully increasing vegetable and fruit exposure. Examples of this were gardening and cooking. So, when designing a product making use of a food theme, might be a smart option. Besides food exposure, social support also has a positive effect on eating behaviour. Technology was also often used to increase the attention span of children with ASD. Using technology in a product may be favourable.

In conclusion, positive and negative reinforcement are the key aspects of all successful interventions. The use of either high-quality social praise, favourite food, or music and/or different types of personal reward are all used as a stimulus. Besides the use of rewards, it is of importance that eating behaviour is monitored and analysed. In this way, the intervention can be adjusted accordingly to be the most effective per child. When new interventions are introduced to children with ASD, having a paediatrician introduce them can be helpful. In this way, if the child is annoyed by a certain intervention, they focus their anger on the paediatrician instead of the parents/guardians. Increasing food exposure and sensory overload is a crucial part of changing the eating behaviour of children with ASD. Social aspects are incredibly beneficial to autistic children, by siblings showing them how to eat. Patience in changing eating behaviour is crucial when attempting to improve eating habits. Not only during the trial periods of mealtimes but also the time it takes to effectively change these habits. Most of the studies have been measured over 4 months or longer. Because of the long duration of these studies and the small sample population, much of this research is conducted done with a small sample size. This makes it difficult to generalise many of the findings.

2.5.2 Main Findings

After analysing products concerning children with ASD, many things are lacking. The most prominent fact is that there are nearly no products to improve mealtime eating behaviour specifically made for children with ASD. Some products are used to improve food exposure, sensory overload, and picky eating, but they do not implement known interventions such as the teaspoon method. There are

applications made for children with ASD, but these too do not focus on eating behaviour. Few products are focussing on the combination of mealtime eating behaviour, autism, and children. The following themes are lacking the most:

- **Interactivity**: The products mentioned before lack interactivity. Technology and applications are barely used to help children with autism even though it has been stated to increase their attention span [19]. There is little communication between the child and the product.
- **Surprise**: Surprises are an important aspect of motivation in children with ASD [32]. If a child is curious enough, they will continue interacting with the product. This too lacks in the known products. Increasing surprises in a product could keep the attention of the child for longer.
- **Progress:** Many applications and playful plates make use of rewards and badges, but progress in the eating behaviour of children is not tracked. Breaking big tasks into small tasks can motivate parents and children to continue. The toys which are available lack a goal or progression.
- **Gamification/playification**: There is nearly no use of these methods to help children with ASD. Gamification is the use of game elements in a nongame context, this could consist of challenges and rewards [ref]. Playification in contrast to gamification is more open-ended, less competitive play [ref]. Both Gamification and Playification could enhance behaviour change methods, by making the product more accessible for children. If behaviour change interventions can be made more fun, it could increase the success rate.

2.6 Requirements

Requirements are necessary to evaluate the product which is to be designed. User requirements, product requirements and ethical requirements have been noted. The user requirements have been based on interviews with the stakeholders. Product requirements have been chosen through analysing the state-of-the-art products to see what was lacking and what could be reused to create a successful product. The ethical requirements have been based on the Code of Ethics for Engineers [33].

2.6.1 User Requirements

1. **Change the eating behaviour of children with ASD**: This is the most important requirement and the goal of this research. The product should motivate children with ASD to eat and support parents in doing so. In doing so, it should decrease the amount of stress at mealtimes.
2. **Eating is a normal practice**: The product should nurture the idea that eating is a normal practice. This means that mealtimes should not be made more special than it is. Children should not receive unnecessary rewards.
3. **Ease of use**: The product should be easily useable for children with ASD between the age of 4 and 6 with the assistance of parents. This also means that it should be implementable at mealtimes.
4. **Ease of Learning**: The product should be easily understandable and quick to learn. That parents can explain it simply to their child in a maximum of 10 minutes.
5. **Portable**: The product should be portable so that it can be brought on holiday or any place where mealtimes are held. Should be able to fit in a regular backpack.
6. **Interchangeability**: The product should stay interesting for the children. They should not get bored of the product after five tries. This can also be done with the use of interchangeability.
7. **Quality**: The quality of the product can withstand interactions with children.

8. **Cost to purchase**: The product should be accessible for all families with an autistic child. This would mean that the price to purchase should not be more than 50 euros, but market research would need to be done to be sure of this.

2.6.2 Product Requirements

1. **Interactivity**: The product makes use of technology and/or electronics as this is lacking in similar products.
2. **Progress**: The product shows the progress and the changes in the eating behaviour of the child with ASD.
3. **Gamification/playification**: The product makes use of gamification and/or playification to encourage the child to eat.
4. **Aesthetics**: There is one coherent theme/colour/style to the final product.
5. **Small threshold**: Van der Gaag & Snijders [4] use a teaspoon of food to persuade the child to eat. This works because to the child it does not look like a lot of food. Making a task look smaller than it is, would be beneficial. This does not only have to be the case for the teaspoon of food, but also other purposes. Many of the mentioned interventions made use of sub-goals such as touching and licking. In product design, the use of sub-goals and splitting up tasks should be thought about.
6. **Reduce conflict**: When designing a product, reducing the conflict between the child and parents can greatly improve mealtimes. The teaspoon method is introduced by a general paediatrician to reduce the conflict between children and parents [4].
7. **Food exposure**: It has been noted that food consumption is improved by playfully increasing vegetable and fruit exposure. Examples of this were gardening and cooking. So, when designing a product making use of a food theme, might be a smart option.
8. **Social support**: Social support was mentioned multiple times in several studies, noting that it had a positive effect on the eating behaviour of children with ASD. Even just seeing other siblings eating food, improved their motivation to eat. Adding cooperative or social play game elements to a product could be a good motivator.
9. **Technology**: The use of technology is stated to help increase the attention span of children with ASD [19]. Using technology in a product may be favourable.
10. **Choices**: Giving children the idea that they have a choice when eating seems to be favourable (playte adventure). Even though the game choices which are made make little difference to how much the children eat, it seems to be a successful method in encouraging them to do so.

2.6.3 Ethical Requirements

1. **Safety**: The product must be safe and do no harm to the user or other family members.
2. **Confidentiality**: If the product collects data to function, the data is not made available to anyone but the product designer.
3. **Only Assess relevant components:** If the product collects data, only the necessary data for the product to function will be collected.
4. **Anonymity:** The user will be anonymous in all interactions with the product.
5. **Undesirable side effects:** The product will not have any side effects which are harmful to the user.

3. Ideation

Ideation is the first step in the Creative Technology design process [8]. The problem definition has previously been determined as with the relevant background information. This phase focuses on idea generation. Several thinking techniques will be applied to come up with ideas such as sketches and a 50 ideas brainstorm. These early ideas will then be evaluated with clients or users. One idea will then be chosen to be further improved.

3.1 Brainstorm phase

The first step in the brainstorming process was to come up with ideas. The first method of brainstorming was done by listing aspects of children with ASD. The plan was to brainstorm for ideas corresponding to a specific aspect. The aspects chosen to start with were low-textured foods, visual, auditory, and tactile sensitivity. Unfortunately, not many ideas came from creating these boundaries. So, it was decided to scrap them, and just start writing down every idea that could be thought of. This resulted in a list of 50 ideas (see appendix D). Some of these ideas were only iterations but were noted down anyway. To further develop these ideas, which were still relatively vague, a sketching brainstorm was done (see figure 10, Appendix D, brainstorm sketch).

Figure 10: Ideation sketching

From the 50 ideas, the most promising needed to be selected. These were chosen based on a conversation with the client. The client noted some important points:

- **Preference for portability**: the final product needed to be able to be easily taken with the family anywhere they went.
- **Preference for a board game**: They thought that this was more suitable for the families it was meant for.
- **A necessity for surprises within the product**: The client mentioned that the internal motivation from the child was so low, that they needed a lot of external motivation to eat. Currently, parents are often using lift-the-flap books where the child can lift a flap after a bite has been eaten.

Since the motivation to eat can be improved with the use of surprises, the question was raised about how to create them in a game. Surprises and emotions of curiosity and wonder are created from *Easy Fun* [34]. *Easy Fun* is fun through intrinsic motivation that maintains player engagement beyond reaching a goal or overcoming an obstacle [34]. *Hard Fun* is goal-directed gameplay, where players have fun through strategy, involving obstacles and completing a goal [34]. With *Easy Fun*, a game is not focused on goal completion or score but is focused on rewards and fantasy or role-play [34]. Surprise can also be achieved through a player's discovery and in-game exploration. It is therefore important to create interactivity and fun without a purpose, in the product.

Some examples were found in games for children between 4-8 years old, where the use of surprise was implemented (See Appendix C). These games served as inspiration for the implementation of surprise in a product. Many games make use of objects suddenly falling. Turning a card or sudden changes in the board/map seem to be a good way of implementing surprises. These types of game methods were used in some of the selected ideas.

3.1.2 Selected Ideas

Based on the preferences from the client and requirements the 50 ideas were assigned points. There were ten requirements selected: Interchangeability, progress, interactivity, gamification/playification, small threshold, food exposure, social support, technology, choices, and surprise. Other requirements

were not used because they were already implemented in all the ideas such as changing the eating behaviour of children with ASD, that eating is normal practice, ease of use, ease of learning, that it is portable, good quality, low cost to purchase and that it should reduce conflict. Each complete idea was then assigned one point per requirement it had. The grading is an approximation. Iterations of an idea were not graded but have been noted in some of the ideas below. The ideas with a score of 7 and higher have been selected. The ideas have been illustrated, to make the idea clearer. Idea 8: the build plant idea has been included even though the scoring was low. This is due to it being an idea that could be incorporated into other ideas. Feedback on this type of idea is necessary to proceed.

Idea 1: Boardgame
A board game where players move a step forward when a bite has been eaten. The player is then allowed to pick up a picture card or press a button to show an animation. This should promote curiosity to eat another bite, so the next card can be seen. These cards can easily be changed to keep the game interesting. This game has the possibility of using lights and music incorporated into the board. It is questionable what the best way is to increase surprises and curiosity. This could be done by having pawns being eaten up if they do not take bites or having a timer.

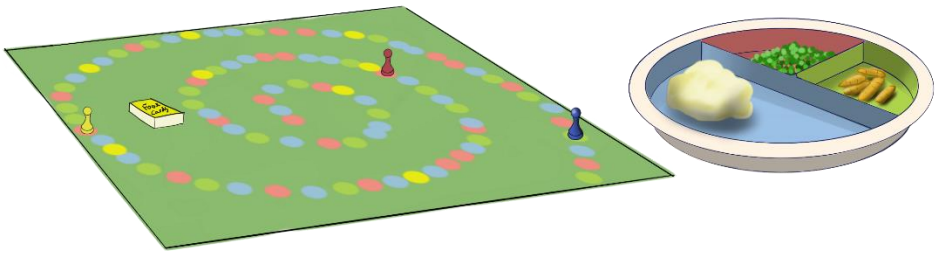


Figure 11: Food boardgame first concept design

Idea 2: Interactive 'Bord Spel'
A dinner plate with coloured sections corresponds to a coloured path surrounding the plate. When a pawn moves to the next coloured spot, a bite should be eaten from the corresponding colour on the plate. If this bite is successful, the child may pick up a picture card or play an animated card. This idea also has the possibility of using lights and music. This could be incorporated by using a weight sensor to note when a piece of food is picked up, and then music is played, or light colour is changed.

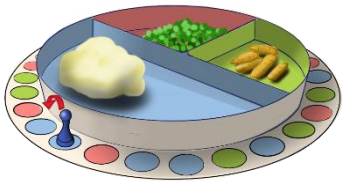


Figure 12: Interactive 'Bord Spel' first concept design

Idea 3: Interactive Storybook
An interactive storybook where buttons can be pressed to show animations after a bite has been eaten. The story can be continuously changed to keep it interesting, by showing different images.

Figure 13: Interactive storybook concept

Idea 4: Grow Strong
An animated child grows by the child eating bites. This supports the idea, that people need to eat to be strong and grow. When the child eats a bite, the animated child also eats a bite and grows. This could be shown as a projection on the table, or a tablet.

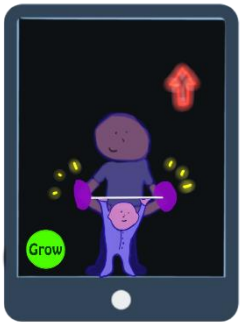


Figure 14: Grow Strong app concept

Idea 5: Food Memory Game
Teaspoons of food are placed in silicone cups on top of memory cards. The child must touch or eat the food in the cup to turn over the card underneath and try and make a match with another card. If the match is not found after turning over two cards, a new teaspoon of food is added to those cups. An iteration could be that the child should touch food that is named. This could be used as a sub-goal for food exposure. The idea is to increase food exposure and introduce the child to new foods.

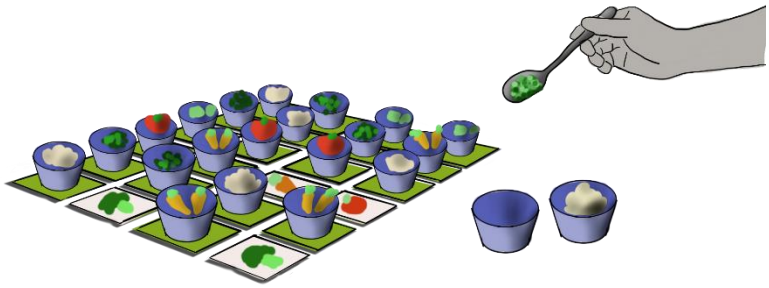


Figure 15: Food Memory Game concept design

Idea 6: Light up the food game
The player follows a map where teaspoons of food in silicone cups are placed along the way. Lights shine from beneath the cups, changing the colour of the food. The light changes colour when the food is eaten. The player should try to light up the whole board by eating all the food. The light could grow from one side or gradually change colour.

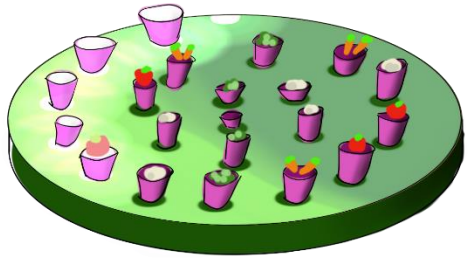


Figure 16: Light up the food game concept

Idea 7: Line up the blocks
Build a line of interactive blocks with food. Each wooden block contains a teaspoon of food. When the

food is eaten it can be moved to form a line. Once added to the line sounds or music are played. Once the whole line of food is created the lights and sounds connect. The sounds and lights can change corresponding to progress made in eating behaviour. A different order of blocks could also change the type of lights and sounds played. The blocks could also have wheels that move across a track. The idea that children with ASD like a task such as lining up cars have inspired this idea.

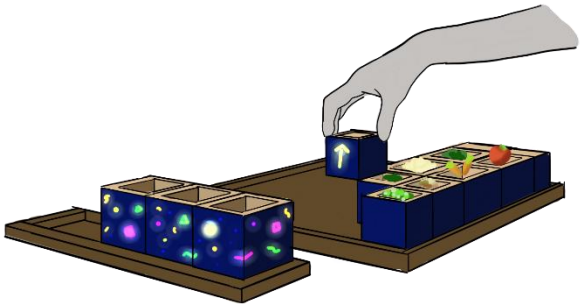
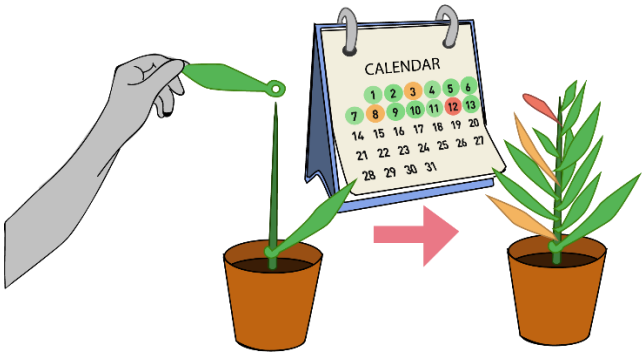


Figure 17: Interactive Blocks food game

Idea 8: Build plant
Build a plant during a period to track the eating behaviour. The child may place a new green leaf on the plant if a meal was successful. This could also be used for when the child eats a certain vegetable, that they then can add a leaf. This could also be incorporated as part of a board game.



3.2 Feedback from Professionals

To determine with which idea to continue two interviews were held. The first interview was to establish more practical knowledge about aspects of gameplay for children with ASD. A second interview was held for feedback on the eight ideas. Interview questions have been determined to guide the feedback session. The feedback per idea will then be discussed and an evaluation will be made.

3.1.2 Interview Client

A semi-structured interview with the client was held about practical knowledge of a child with ASD's curiosity, play, attention span, communication, sensory-motor functions, and development (Appendix E). The interview has been coded in seven categories and summarized below. A selection has been made which could be of interest to the design of the product.

- **Curiosity**: Children with ASD are very reliant on their environment and their parents which determines what they do in a day. Autistic children do like to discover more than TD children.

- **Development**: Music helps the development of children with ASD especially when it comes to communication skills. Lights, sounds and pictures encourage curiosity and improve the development of the child. Distinguishing and recognizing details and patterns is one of the strengths of children with ASD. The sensory-motor functions of children with ASD do have a developmental delay.
- **Play**: Children with ASD and fears often have difficulty starting to play. They often need help from adults to start playing. Autistic children prefer functional gameplay instead of fantasy play. Games with structure make it easier for the children to play. In practice, children with ASD do like competitive games where the focus is on winning. The preference goes out to do the same patterns the whole day. There should be something that stays unknown, for example, another level, to develop their play and curiosity. Children with ASD also like movement, like moving a train or car.
- **Autonomy**: It is important for children with ASD to feel like they are in control. During mealtimes the child is often given two choices, to give them the idea that they have autonomy. The given choices should be limited though.
- **Touch**: Children with ASD often have difficulty with touching due to overstimulation. Examples are sand, water and mud. They prefer toys made of hard pieces such as wood.
- **Communication**: There is often a delay in the communication skills of children with ASD. It is mostly one-sided communication from parent to child. It can be difficult to know if a child has understood game instructions. Sometimes placemats are used at mealtimes with mealtime instructions.
- **Attention span**: The attention span of a child with ASD is often 15 minutes but no longer than half an hour.

3.2.1 Interview Questions for Feedback Session

An interview will be held to receive feedback on the eight concept ideas. The interview involves the two main clients. The ideas were sent before the interview so the clients would have time to read them and form an opinion. Some questions have been created to help lead the semi-structured interview:

- What are the 3 best features of this idea?
- What are the 3 worst features of this idea?
- What would you want to add to this idea?
- What would you want to remove from this idea?
- How would you grade this idea from 1 to 10?

Not all questions were asked at every idea since the answer was often already given. These questions were only used to lead the discussion. The duration of the interview was only 30 minutes, so there was not much time to discuss all the feedback and questions in full.

3.2.2 Feedback per Idea

The feedback from both clients has been summarized below. Both clients graded the ideas at the end. The average of these grades has been mentioned. Overall, they said that many ideas were good for different moments in the eating process. The favourite ideas of the clients were ideas 1 and 2 because they matched the type of product they were looking for.

Idea 1: Board Game

The clients liked the concept that the colours on the plate matched the colours on the board. They thought it was a good idea that animation or card was revealed after eating a bite and that the curiosity would be enough. They did mention that it was important for parents to establish the

connection between the game and the plate. That would possibly need to be made clearer through the game mechanics. The clients also mentioned that there should be a luck-based aspect to the game. That if the child already knew that the next bite would be vegetables, they most likely will already stop eating, therefore they recommended using a die, to determine the next spot. A note was also made of giving information about food on the animations or cards. The client mentioned a preference for first eating a bite and then moving the pawn.
Grade: 7.5

Idea 2: Interactive 'Bord Spel'
There were different preferences among the clients, due to board games being integrated into the plate. It was mentioned that the use of a weight-sensor would be difficult because it only registers if food has been removed but not if it has been eaten. They mentioned using animation to make the connection clear. The client thought ideas 1 and 2 should be combined.
Grade: 7.5

Idea 3: Interactive Storybook
The favourite aspects of idea 3 were the surprise effects of pressing the buttons. They also mentioned the possibility of adding educational stories. The downside of this idea was that it would become too predictable. They also mentioned using this for younger children. The client felt that this would only be useful when it would be a part of idea 1 or 2.
Grade: 6

Idea 4: Grow Strong
There was a consensus that this idea would be good as part of something else, but not as a standalone intervention. The clients thought it would become boring after a while, knowing that the child would grow every time. They came with the idea of using different plants or animals which would grow, instead of only being a child. They mentioned that it would be a nice motivator for mentors and guardians because it would give clear data.
Grade: 6

Idea 5: Food Memory Game
The clients thought that this was a good idea for introducing new food types in clear small portions. They thought the idea was very creative and original but would not work in practice. The parents would need to prefer a lot of food for small bites and there would be a lot of dishes. They thought it would be okay for a one-time thing but that parents would then think it was too much effort. Most parents who ask for help are so tired, they want as little work as possible.
Grade: 6.5

Idea 6: Light up the food game
The clients thought this would be too one-sided, that it would not create enough curiosity to continue and that the reward was not big enough. They also mentioned that there was no luck involved in the game. They thought it was technically very creative but there was not enough competition, and it was too predictable. They also mentioned the effort of the dishes and the setup.
Grade: 6

Idea 7: Line up the blocks
The clients thought it was good how visible it was for children to see the result of what they were eating and that they then get rewarded with the animation on the blocks. They mentioned that this idea does take the eating experience further away from 'normal'. The clients did mention that this idea would be useful for experimental sessions and training children with new products. They mentioned that this idea would be good for sensory integration, but not as an intervention.
Grade: 7

Idea 8: Grow a plant
The clients thought this idea would not work as an intervention but was a pleasant way of keeping a track record. It is a reward card in the form of a plant, that shows the child's progress. This would be a good way of confronting children with their eating behaviour being that positive or negative. It would

be good for showing long-term progress and to see the colours changing.
Grade: 7.5

3.2.3 Discussion of Feedback

There was a consensus that ideas 1 and 2 with the board game were the best. The relation between the colours on the board and plate were appreciated. Animation seemed to be preferred to physical cards if the animation became a part of the board. A combination of these two will be chosen for further development. Some important notes were made to improve the product:

- **Luck**: There should be a luck-based aspect to determine the next bite, so the child does not know what is coming.
- **Educational**: There was a preference for the use of educational elements shown on the cards or animations.
- **Order of play**: A bite should be eaten before the pawn is moved.
- **Game mechanics**: The connection between the game board and plate should be clear.

3.3 Conclusions

After a lot of brainstorming a conclusion has been made to continue with an interactive board game where the colours on the plate correspond to the colours on the board. This decision was made after feedback from the clients. Luck, educational aspects, order of play and game mechanics will be adjusted among other design choices. From the interview was discovered that lights, sounds and pictures help encourage curiosity. It is also important for children to feel like they have autonomy. There is a preference from children with ASD for hard materials such as wood or plastics. There are many aspects and decisions to make on how to improve the interactive board game idea. These decisions will be discussed in the following chapter.

4. Specification

The specification phase is used to further improve the product, determine design choices and specify how the prototype will be made. To make these design choices, prototypes and interviews will be used. Requirements will be used to evaluate the design.

4.1 Design Choices

Countless design choices can be made regarding a certain product. For this project, the most important choices regarding children with ASD will be discussed and decided on. Some general design choices need to be chosen first before the more specific choices can be made.

4.1.1 General design choices

Four main design choices have been established which determine the most important game mechanics.

1. **Digital technology**
   Should the product be electronic, incorporate digital technology or not? For many of the ideas, the use of lights and music is optional but could improve the attention span and interest of the children. The question is also raised if the use of an application is preferred at the dinner table, even if said application is only used to help with eating. By using a mobile device, animations could be shown which are incorporated in the game or product.
2. **Players**
   Should the product be made for one participant or should other family members be included? Some ideas are easier as single-player games, but others need to be multiplayer. Whether multiple players help the child with ASD is the main question. What would work best to incorporate the product into mealtimes?
   "*Multiple players are not a good idea because then the attention on the child is removed*."
3. **Cooperative or competitive**
   When it comes to multiplayer board games, should the game be cooperative or competitive? Does competition motivate children with ASD? Should players work together or race against one another?
4. **Turn-based or continuous play**

To make the decisions concerning these design choices, the opinion was asked of the clients during regular project meetings. When asked about the incorporation of technology and electronics in the board game the response was that technology should only be used when it is helpful and adds to the mechanics of the game. They did believe that the use of technology or electronics would be beneficial because it makes the product enticing for children. Hearing this in combination with literature previously stating that technology increases the attention span [19], the decision was made to incorporate electronics/technology in the final product. How this will be done still needs to be considered.

Secondly, the question was asked what the clients thought about having multiple players. Both clients thought it was better to not have multiple players because the attention on the eating behaviour of the child with ASD would decrease. They thought the game would then become too distracting for the child. Therefore, the decision has been made to make the interactive board game a one-player game that can be supported by a parent. By making this decision the design choices of cooperative or competitive and turn-based vs continuous play become insignificant.

4.1.2 Specific Design Choices

Many small decisions together determine if a game is successful. These have been listed below:

1. **Card Design:** The design of the cards is an important feature in gameplay. If the cards are designed correctly, they will be successful motivators for children with ASD to eat. When creating the card design it is important to think about the following features:

a. **Animation on a phone or Illustrated cards**: The benefit of using illustrated cards is that they can easily be changed by new pictures and therefore making the product more interchangeable. Animations can improve the curiosity in children and portray information better. The recommendation of using technology is strengthening the idea should also be considered in this decision.

b. **Educational info**: The decision to add education info was recommended in the feedback interviews. The question is now what type of information should be added. Should it concern fun facts about food, nutritional information, how it is grown or a combination? The question is also how this information can then be portrayed in a simple way for children between 4 and 6.

c. **Style**: The style of the cards can include colour palettes as well as the type of illustrations.

2. Board Setup

a. **Board layout:** The feedback sessions determined that there was a divide in preferences concerning a separate board game or if it should be incorporated in the plate. This is a crucial decision determining the game mechanics.

b. **Dice or spinning wheel**: A luck-based aspect needs to be added to the game. Two options to do this would be with a die or a spinning wheel. The spinning of a wheel could be too distracting from the gameplay.

c. **Use lights in-game or not**: Using lights in the game board could make the game more exciting, but it could also make the game more complicated. From the feedback session, it was determined that the light-up board game, would not add much curiosity. Keeping the game simple may be better and clearer.

d. **Pawn or Car**: The interview with the client showed that children with ASD like to move objects such as trains or cars. The question is then whether using a moveable object such as a car as a pawn, would increase the interactivity and willingness to move the object. If a car was used the question is then also raised whether the game board should have tracks, or it should be a flat plane.

3. **Game mechanics**:

a. **Surprise cards or special spots**: Should surprise cards be added to the (digital) card stack or should there be special spots on the board. Having surprise cards could increase the motivation to pick a card but could also complicate the idea of the cards.

b. **Give away a bite**: This could be used as a second motivator that after so many bites, steps or at a certain point, the child may give away a bite.

c. **Mini-game**: Should there be mini-games incorporated in the main game. This could be used as another motivator, but it could also make the game more complicated.

d. **Choosing the food**: Should there be places on the board where the child can choose the food they want to eat? This could add to the idea of autonomy and make the game more diverse. It could also make the game more complicated.

e. **Move forward or move back**: This could add some excitement to the game, by having some action spots. If the player lands on a spot that moves them two spots forward or two spots back, or that the play can roll the dice again.

f. **Plate sections**: How many sections should the plate have. If there are too many, the parents need to cook more food every mealtime. If there are too few the foods will touch. What colour should the sections be on the plate? Should the sections correspond to protein, vegetables and carbohydrates?

g. **Ratio**: The spots on the game board need to have a specific ratio. Vegetables should maybe have a larger ratio than the carbohydrates section. This needs to be determined to improve the gameplay.

4. **Theme:**

a. **Food or plants or farm or kitchen**: The theme of the game should be food-related to improve food exposure, but a food theme can still have many options. It could relate to plants, a farm, a kitchen, food friends or other options. The theme is a design aspect that can be determined late in the design process.

b. **Images on the plate:** Should there be images on the plate sections? This could improve curiosity to see the image underneath.

c. **Wood or plastic**: Should the game material be made of wood or plastic. From the interview with the client, it was determined that children with ASD prefer hard objects. Wood and plastic are the most obvious choices.

4.2 Card Design

The card design will be the main motivator for the child to eat a bite of food. The card design consists of what should be shown, how it is shown, the style and the type of technology used.

4.2.1 Animation or illustrated cards

The first decision to make is to decide whether animated cards should be used or illustrated cards. Since a recommendation was made to use technology to strengthen the concept, animated cards contribute to this. Animations can show more information compared to a static illustration especially when it concerns young children. It can also increase the attention span of children with ASD, therefore, being a better motivator.

4.2.2 Educational information

The second decision to make is what type of educational information should be shown. The goal is to increase food exposure, so the cards need to show food in some way. Children between the ages 4 and 6 are only just learning to read, so the information which is shown also needs to be simple. Nutritional information, therefore, seems too abstract for this age group. A dietician stated that nutritional education for young children should be changed [35]. Traditional nutritional education teaches children about how much protein and carbohydrates are for example in foods. Instead, children should be taught about how food grows, how to cook it, the sensory properties of food and food names [35]. The question then also arises if there should be a voiceover added to the animation or if the information should only be portrayed through images. The downside of a voiceover is that it may be too distracting from the mealtime, not only for the child with ASD but also for other family members at the dinner table. Music and sound effects could be added with the option of turning them off.

The time it takes to play the animation should also be considered. The longer the animations take the longer the mealtimes take. Since the attention span of a child with ASD is roughly between 15 and 20 minutes, time is a priority. The animation should not last longer than 5 seconds. Showing a lot of information in such a short time is therefore difficult and should be avoided.

To decide what type of animations should be shown, three short storyboards have been drawn. An apple has been used as an example. Figure 18 shows where food comes from or how it grows. It shows an apple growing on a tree, dropping from the tree and then being introduced as an apple. This would then educate the child about where food comes from and the name of the food.

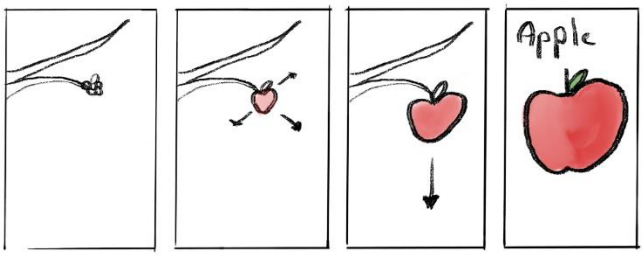


Figure 18: Animation concept: How an apple grows

A second option is to focus on what the food looks like. This could include the cutting of food, seeing the inside, rotating the food or showing a simplified version of how it is cooked. In figure 19, a short storyboard is shown of an apple being cut, and the inside of the apple being shown. This would educate children about the sensory aspects of food, what it looks like and the name of the food.

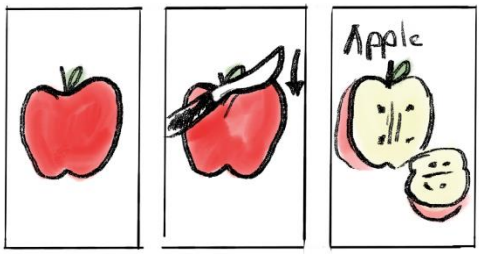


Figure 19: Animation concept: What an apple looks like

A third option is making the idea of food playful. This could be done by adding a face to the food to create food characters. In figure 20 a character has been made from an apple, which could wave, the face and arms then disappear to finish with the image of an apple. This could educate children by giving a positive feeling to food and also teaching them the food names.

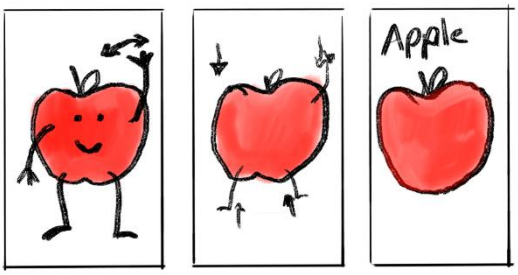


Figure 20: Animation concept: Food character

A fourth option could be that a certain food is portrayed as being eaten by a mascot. A mascot was used in many applications in the state of the art. It could also be part of a game theme where every time a bite is eaten, the mascot eats a different food as well. This would still educate children about certain food names while also being an extra motivator, feeding the mascot. An example can be seen in figure 21 where an apple is shown and then eaten by a mascot. If this idea was chosen, a decision should also be made about what type of mascot should be chosen.

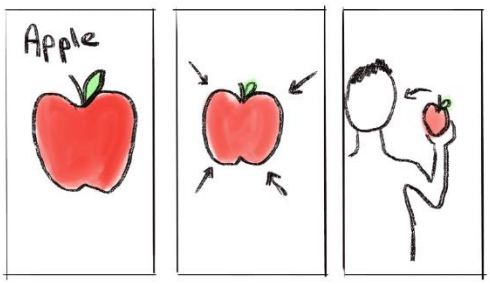


Figure 21: Animation concept: Mascot eating food

To conclude, the decision was made to show animations of how vegetables are grown (figure 18). This was chosen for the reason that it was most educational and yet simple to understand. There is also a possibility of showing many different types of animations rather than a single concept. Animations could be played with varying levels of education to match the development of the child and keep it interesting for them. For this project, the focus will be set on one type of animation.

4.2.3 Style

The third decision to make is what type of style the cards should be drawn. Some possible options have been drawn below as a comparison (figure 22). From left to right: flat, 3D, gradient, sketched, organic lines, line and fill, abstract, and another sketched version. There are many more types of drawing styles but these 8 have been selected for simplicity and clarity.

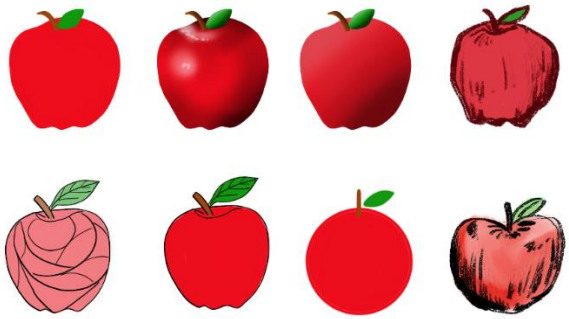


Figure 22: Drawing style concepts

These designs were sent to the clients for advice. The conclusion was that apple 6 would be best because of simplicity and clarity. The animations will therefore be drawn in a similar style.

4.3 Board Set up

The board set-up will determine how the player moves around the board. This consists of the board layout, game pieces and the use of in-game lights.

4.3.1 Board layout

The layout of the board can change the whole game mechanics. To make a decision on what would be the best board layout several sketches have been made. Layouts have been drawn with and without a loop and with or without a plate. Figure 23 shows some possible layouts with a start to finish. This could motivate children to aim to reach the finish. Several products (Playte adventure and dinner winner plate) in state of the art use a start and finish to motivate children to eat. The downside is that children could reach the finish too soon if they have lucky numbers or not reach the finish at all if the plate is already finished.

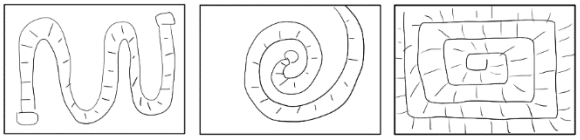


Figure 23: Game board layout start-finish

Figure 24 shows possible game board layouts with a loop in the board. The benefit of having a loop is that the game can continue till the food on the plate is finished. The downside is that the children may not see a goal and that it is therefore demotivating. When designing a loop it could be playful to put the loop in the shape of food, for example, broccoli (fourth image).

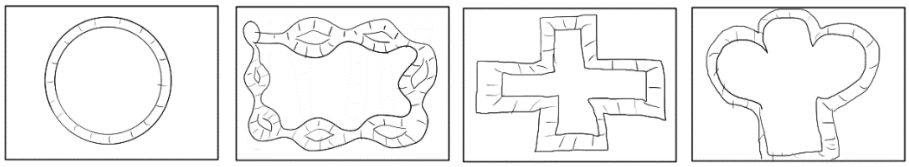


Figure 24: Game board layout with loop

A third concept is having a loop go round the plate. Four possible layouts are shown in figure 25. The preferences differed between the clients to have a board game going around the plate or separate from the plate. A possible solution to this is to make the board game versatile. A board could be made in the form of a placemat, which could be placed underneath the plate or easily separated. A rectangle placemat could have the benefit of keeping the table cleaner, showing illustrations and having a spot for the cards or phone. For this reason, it was decided to have a rectangle placemat instead of a circular placemat.

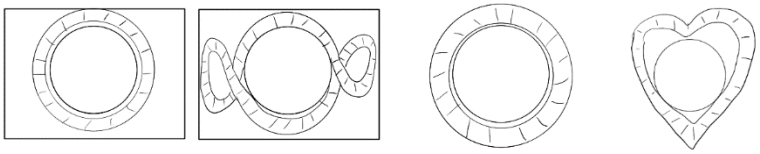


Figure 25: Game board layout with a loop around the plate

To conclude, based on these iteration sketches a board game with a loop seems like the better option. This way the game does not stop too early or too late when it comes to finishing the food. To give the child the idea of reaching a goal with a loop, there could be a small reward or surprise every time a loop is completed. This could add motivation to the eating experience. The choice was also made to have a rectangle placemat.

4.3.2 Die or Spinning wheel

In the feedback session, a recommendation was made to add a luck-based element to the game. This could be done with either a die or spinning wheel which would determine the next bite the child could eat. The use of a die or spinning wheel could even be used solely for the determination of the next bite. The choice to use a board game in combination with the die is that a board game can show progress were a die alone cannot.

A prototype of a spinning wheel was made to test its use in game play (figure 26). It was found that the spinning of the wheel was a lot more fun than rolling a die, but the spinning wheel was not as fair. The spinning wheel could also take longer to spin than it takes a die to roll. This would again prolong the eating time, which needs to be avoided. A die is a simple game mechanic which can easily be added to any game and would also take up less space when transporting. The question is also raised how the spinning of the wheel would be for children with ASD? Would they be overstimulated? If so, a die would be a better option. Because of these uncertainties, the choice has been made to use a die.

Figure 26: Prototype spinning wheel

The second choice which then needs to be made is whether numbers or colours should be used on the die to determine the next bite. If colours are used the die decides what bite should be taken. The use of the board is then unnecessary. As previously mentioned the use of a board was chosen to show progress. The board layout can also decide on the ratio of which type of food should be eaten. If both the die and the board were to decide the ratio, it seems arbitrary. Counting the spots could also be more fun for the child. The die could still be an adjusted die, with a special spot and only numbers going up to 3. This would need to be tested, to decide how the game would play exactly.

4.3.3 In-game lights or not

The use of lights in the game is an important decision to make, it could change how the game is perceived. The benefits of using lights are that they could add curiosity and excitement to the game. Using lights in the board game does not add an extra element of gameplay if it is only about lighting up the spots. To use lights as a game element, it could be added by changing the colour of the spots on the board at a certain point or if the player lands on a certain spot. If a game element of changing the spots on the board should be added, it may be better to just have a shiftable wheel underneath. That way the game would not be as breakable and the board would be easier to use as a placemat. Adding the game mechanic of changing the spots also does not seem like it would add much to the game. The use of a die already adds a luck-based element and changing the spots seems like an unnecessary part of the game. As previously mentioned technology should only be used if it adds an extra element to the product. So to conclude since the use of lights in the game does not add much to the gameplay, the decision has been made to not include them.

4.3.4 Pawn or car

When deciding between a pawn and a moveable object the most important thing to consider is which one will be more motivating for the child. In the interview with the client, it was mentioned that children with ASD especially like to move cars and trains around. Because of this, the idea of using a car as a pawn was raised. The benefit of using a pawn is that it could make it easier to count the spots once the die has been rolled. A pawn could also easily be personalized as an avatar or fake vegetable. If using a car the wheels could always be turned so that it drives in a perfect circle. Even though a moveable object could be motivating the choice for a pawn was made. It was decided that a moveable object could be distracting from the idea of the game. A pawn is simplistic and recognizable, especially when the focus should be laid on eating instead of moving a car.

4.4 Game Mechanics

The game mechanics determine how the game is played. The concerning design choices consist of the use of surprise cards, special spots, mini-games, plate sections and what the player can do.

4.4.1 Surprise cards or special spots

Using surprise cards or special spots could make the game more interesting and motivating for the child. The game then becomes more than just taking bites. What these specials cards or spots could be, will be decided later. Having special cards in combination with the educational animations could

be seen as unclear. The game may be more understandable if the device playing animations only shows these animations. Having special spots on the board together with the other coloured spots have a clear task. The choice is therefore to use special spots on the board.

4.4.2 Give away a bite

The idea to give away a bite to another family member or a dog could be a successful motivator. After the choice was made to use a loop, giving away a bite could be the goal for when a loop is completed. If this addition to the game were to be added too often, it could be that the child does not eat enough. This could give the player the idea they are moving towards a goal and that it is not an unending circle. Giving away a bite was used in 'Playte Adventure - Feed the crocodile' (Appendix B, Playful plates). This game has been thoroughly tested and therefore it could be concluded that this addition would work.

4.4.3 Mini-game

Adding mini-games to the main game could make the game more interesting and add a social aspect to the game. Possible mini-games could be looking at the food through coloured glasses or a type of memory game. It could also make the game more complicated and distract from eating the food. A second downside is that it may take up more time than the limited 20 minutes. Even though there are many possibilities to making the game more fun, the overall conclusion would be to not include mini-games.

4.4.4 Choosing the food

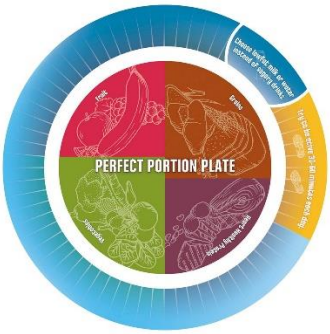
To diversify the landing spots on the board, there could be a spot where the child may choose the food section they would want to eat. The downside of this is it will most likely be very predictable (not vegetables) but it could give the child the idea of autonomy. The ratio of how many vegetable spots there were could therefore be increased to balance out how many vegetables would be eaten. The clients were also asked if giving the children a choice in choosing their food was a good idea. They said that it would be possible only if it was caused by the luck element of the game. They thought it could make the game more interesting. The decision was therefore made to add a 'choose the food' spot.

4.4.5 Move forward or move back

Many board games have game tiles that make the player move, for example, two steps forward or two steps back. This could also be used in this eating game, to add more variety to the moves. Another option could be to let the player roll again. This may be a better option since moving two steps forward or back, the player will always land on the same spot. The downside of adding a roll again tile is that it takes more time from the mealtime, but this should be minor. A decision is therefore made to add a limited amount of roll again tiles.

4.4.6 Plate sections

When looking at sectioned plates the vast majority makes use of a 3 split but there are some which make use of a four divide. The portion plates divided by four intend to use a portion for fruit, vegetables, grains and proteins (figure 27). The plates with 3 sections do not include fruit (figure 28). At dinner times it is mostly not custom to eat fruit, so there would be a preference for a 3-section plate. However, it is often the case that multiple types of vegetables or other foods are cooked for a meal. The number of foods cooked also differ per mealtime. For this reason, the plate would be best if it was versatile. A new section plate was designed to solve this problem (figure 29). Two sections can then be switched out. There is an option to have one large vegetable section, two small vegetable sections or a vegetable section with another category. The extra category will then be eaten when a player lands on the choose preferred food spot. There would be grooves in the bottom of the sections, to keep the sections in place. This way the parents have more options of how they cook their meals. Not only is it more versatile for the cooking options, but it can also be used to gradually switch to eating from a standard plate, by removing the sections. This idea could also be executed by creating three separate plates in the same way, but then there is no transition to switching to a standard plate.



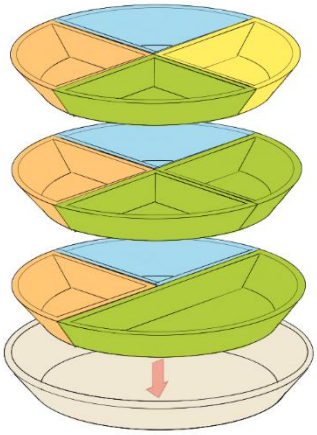


Figure 27: Perfect portion plate with 4 sections
Figure 28: Foodbank portions with 3 sections
Figure 29: Switchable sections concept design plate

4.4.7 Ratio

The ratios of the different food sections will determine if the game works or not. They need to be equal enough that there is not one section of food finished before another. To determine the ratio's of the spots, there first needs to be determined how many spots there should be. To test this a circle was drawn on an A3 piece of paper (figure 30). An A3 paper is the average size of a placemat. The circumference of the circle where spots would be was calculated divided by a spot size of 2.5cm. The spot size was chosen as a relative size preference for a pawn. This calculation came to an estimate of 30 spots.

The giveaway food space will only happen once every loop and will also be activated if passed. This means that the ratio of the giveaway food is always 1 in 30. The first ratio option would then be to divide the remaining 29 spots by 4 then add one more spot to the vegetables.

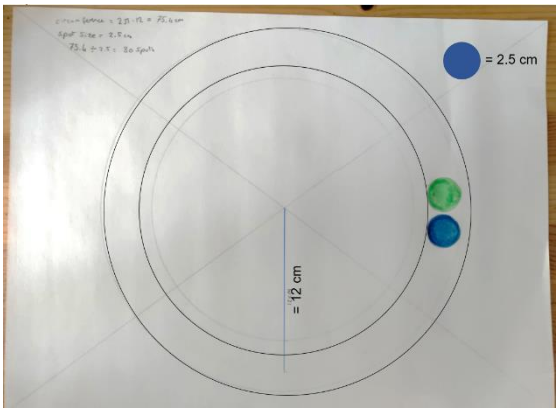


Figure 30: Board game drawing to determine spots

The roll-again spot should not be included more than 3 times in a loop. If the player is lucky enough to land on all of the roll-again spots, they will barely eat in a loop, but still, give away a piece of food.

On the choose-food-space, the child will most likely not choose vegetables unless the choose-food-space is used as an extra section. For the giveaway food space, the child will probably decide to give away vegetables. For this reason, the vegetable spots should be increased, and the other spots decreased.

Action	**Ratio 1**	**Ratio 2**	**Ratio 3**
Vegetable	7/30	9/30	12/30
Protein	7/30	6/30	5/30
Carbohydrates	7/30	6/30	5/30
Choose food/extra food section	7/30	6/30	5/30
Roll again	1/30	2/30	2/30
Give away food	1/30	1/30	1/30

It is difficult to determine what the correct ratio levels should be for the game to work properly without

testing the game. The ratios have now been mostly determined by probability and portion size. It may be a possibility to use different ratio levels for improvement of eating. So that the player first starts with equal vegetable spots and once they progress, the amount of vegetable spots increases.

4.5 Theme

The theme determines the main aesthetics of the game. So what is the design theme, will there be images on the plate and what is the material used.

4.5.1 Food or plants or farm or kitchen

The choice was made to use animations showing how plants grow. For this reason, the theme of the game should match the animation theme. Possible options are a garden or farm or another place where food grows. It is also important according to the clients to not overwhelm the child with input. For this reason, the placemat should stay simple. The choice was made to have grass underneath the board game layout with a few vegetables showing through the grass. This connects the theme and does not overwhelm the child.

4.5.2 Images on Plate

As seen in many state-of-the-art examples, many plates have fun images on them. This is done to increase the interest of the child to finish their plate so they can see the images. This may also be a good idea to use as an extra motivator. The clients were asked if images on the plate would indeed help the child. The recommendation was to not have images on the plate. This advice will be followed.

4.5.2 Wood or plastic

The material determines the final touch of the product. For the board game or placemat wood or plastic are the best options. Plastic is easier to clean if it is used as a placemat and it is easily portable if it is foldable plastic. Wood is stronger and could stop the plate from sliding with an engraving. If the choice is made to have a car, wood could create rails for the car to drive on. A combination of both could also be used, to have a plastic placemat covering the top of the wooden board. The final decision was made to use a plastic placemat instead of wood for the reason of portability.

For the plate, silicone seems the best option. Silicone is used in nearly all food products for children with ASD and is recommended by many. It is also easily portable and washable. However, when creating the prototype, silicone will most likely not be used.

4.6 Requirements

The requirements for the product which were found in chapter two will help evaluate the specialization phase. Each requirement will be considered concerning the game. Even if not all requirements are met, the goal is to include as many as possible.

4.6.1 User Requirements

Change the eating behaviour of children with ASD

This is the goal of the research. Till this point, the clients have been very positive about the possible success of the product. Other than that, it is still unknown if this product will indeed change the eating behaviour of children with ASD.

Eating is a normal practice

The board game has been attempted to keep as close as possible to a ‘normal’ eating practice. The child will eat from a plate the same as everyone else and does not receive gifts for eating. Although the reward is used, it is not an unnecessary large reward.

Ease of use

The pressing of the button on the phone, rolling the dice and moving the pawn are simple actions. The use of several items should be understandable.

Ease of Learning:

The game has been made to be as simple as possible. It is still difficult to know if it will be easily

understood by children with ASD. Icons will be used on the board game layout to clarify the action of the spot. With the assistance of parents, the hope is the children will understand. This can be asked of the parents during evaluation.

Portable
A placemat type of board was chosen so that the game would be easily portable. The use of a die instead of a spinning wheel was also chosen for the same reason. All elements of the game should be able to fit in a backpack.

Interchangeability
The use of different animations keeps the game interesting. Although the creation of animations is a time-consuming process, many new animations could be developed in the meantime. It is also possible to use illustrated cards if the animations get too boring.

Quality
The product will be a hi-fi prototype at the end of this research, so quality is not an aspect that can be required in detail. It is also not yet known what the final quality of the prototype will be at this stage.

Cost to purchase
The purchasing costs are still unknown at this point, but the expectation is that they would still fall within the price range.

4.6.2 Product requirements

Interactivity
The game makes use of interactivity by pressing the button to play the animation, moving the pawn and rolling the dice.

Progress
At this point, the product does not show much long-term progress. The idea would be in the future use to change the types of animation shown and to increase the number of vegetable spots on the game board. These progress areas are focused on new layouts but not on tracking the progress of the child. The game does make use of short-term progress by reaching the end of the circle, so a bite can be given away.

Gamification/playification
The whole product makes use of gamification/playification since it is a board game. The child receives a reward for eating a bite (watching animation) and progresses to the end of the game.

Aesthetics
There is one coherent theme/colour/style to the final product namely the growing food theme. The style of the drawings is all made simple and understandable. The board layout portrays grass with vegetables and the animations show vegetables growing.

Small threshold
A teaspoon of food is used per turn to persuade the child to take a bite. This is a small threshold for the child. Another small threshold implemented is the goal of completing the circle to give away a bite of food. The loop seems small and therefore the child sees that as the goal to complete.

Reduce conflict
The use of the game as a method for eating could be seen as a way to reduce conflict. In this way when the die is rolled the die decides what the child eats and not the parents. This game could also be introduced to children by a paediatrician to reduce conflict between parent and child further.

Food exposure
A food theme is used within the game to increase food exposure. The animations shown are educational about how food is grown. This contributes to food exposure.

Social support
The game does not fully incorporate social support or multiple players. When the clients were asked

about having a multiple player game, there was a preference for single player. The only social support element the game includes is that a parent or guardian regulates the gameplay.

Technology
Digital technology is used in the game by showing animations. This contributes to the game mechanics and increases the attention span of children.

Choices
The game makes use of a few choices. The yellow spots give the child the option to choose which food they would like to eat, but in reality, they are still eating food. This gives the idea of autonomy when it does not make a difference. The rolling of the die can also be considered as a choice.

5. Realisation

In the Realisation phase, the prototype is produced. The design choices have been made to determine what the prototype should look like in the previous chapter. So now it will be realised. The programs and methods used to create this prototype will be described while presenting the final prototype. The following programs were utilised:

Adobe Illustrator
Adobe Illustrator was used for the design of the board layout as well as drawing all individual elements. The vegetables which were animated were drawn from scratch and coloured with simple gradients. Illustrator provided vector images that were necessary for the animation. It was also possible to keep the style consistent.

Adobe After Effects
Adobe After Effects was used to make the animations. The branches of the plants were made with animating strokes whereafter the previously drawn leaves, grew from these branches. Little details such as the sun shining, the vegetables changing colour and the waves in the branches were added to create a finished look. The animations are all seven seconds to keep consistency. A lot is shown in a short time, which should keep the user interested in the animation.

Autodesk Fusion 360
Autodesk Fusion 360 was used to model the concept plate. The plate could then be 3D printed. The program made it possible to model to exact measurements.

Processing/P5JS
Processing was used to make an app prototype. A code was written so that when the button was pressed, a random animation would be played. It would show the full functionality of the app. The code was written in such a way that, new videos could easily be added. A random function was used to randomize which video was played. In future, it may be helpful to let the application remember which videos were played, so there is no repetition. Unfortunately, processing does not allow the use of playing videos in an application. To combat this problem the code was rewritten to P5JS in processing. With p5JS an online server was created which could be accessed from a phone. A folder with documents could then be downloaded on a phone and using an HTTPS server app (which creates a server), the application could be accessed. The code can be found in Appendix F: Code for Processing/P5JS.

5.1 Animations

The animations were drawn in the style chosen by the client, where clarity of the vegetable was most important. Animation screenshots of each animation are shown below. The animations can also be seen with this link:
https://drive.google.com/file/d/1G3w7nnxgr458IDXtPiybIN4Uyg4Uzs0C/view?usp=sharing

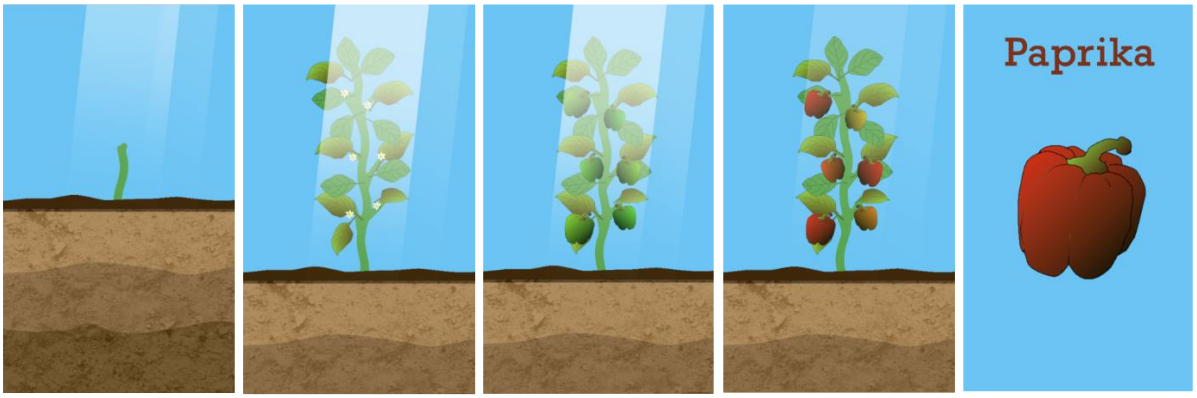


Figure 31: Animation stills of bell pepper animation

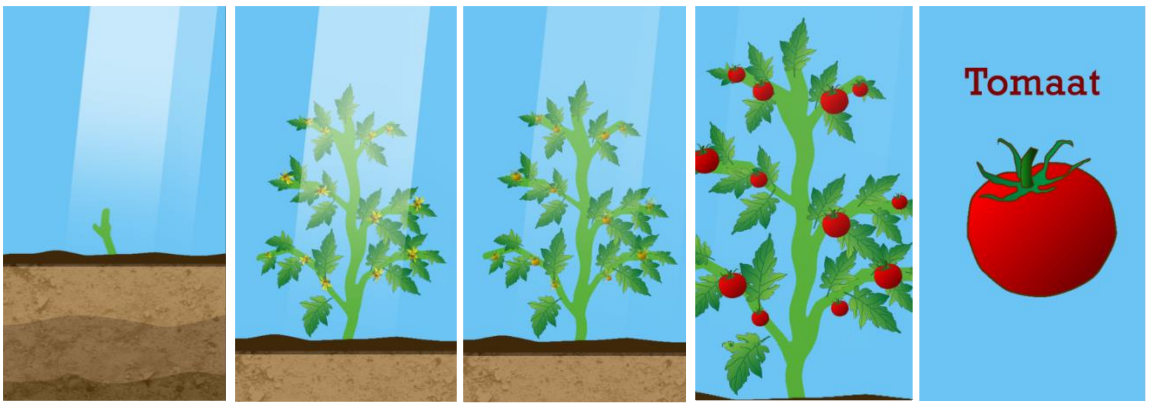


Figure 32: Animation stills of tomato animation

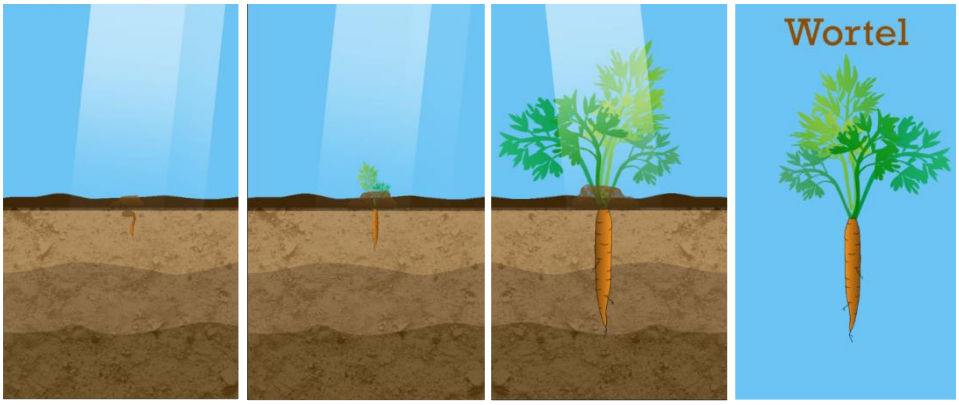


Figure 33: Animation stills of carrot animation

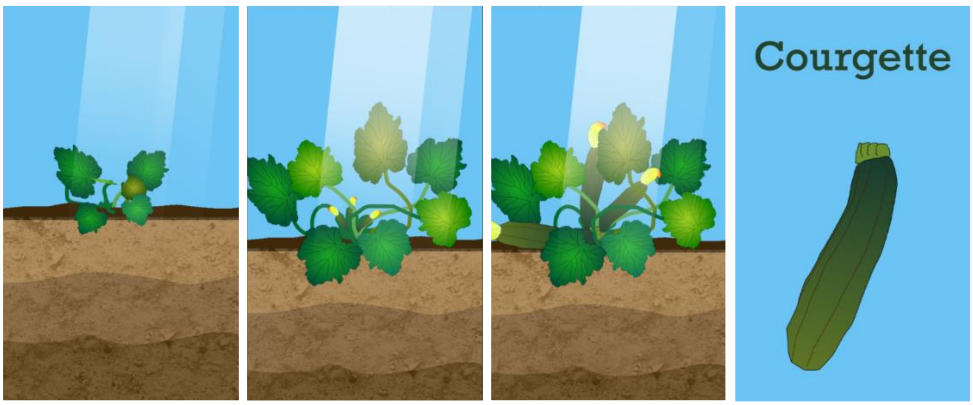


Figure 34: Animation stills of zucchini animation

5.2 Board Layout

The board layout was designed in Adobe Illustrator to then be printed and laminated. Figure 36 shows the physical prototype with a die and pawn.

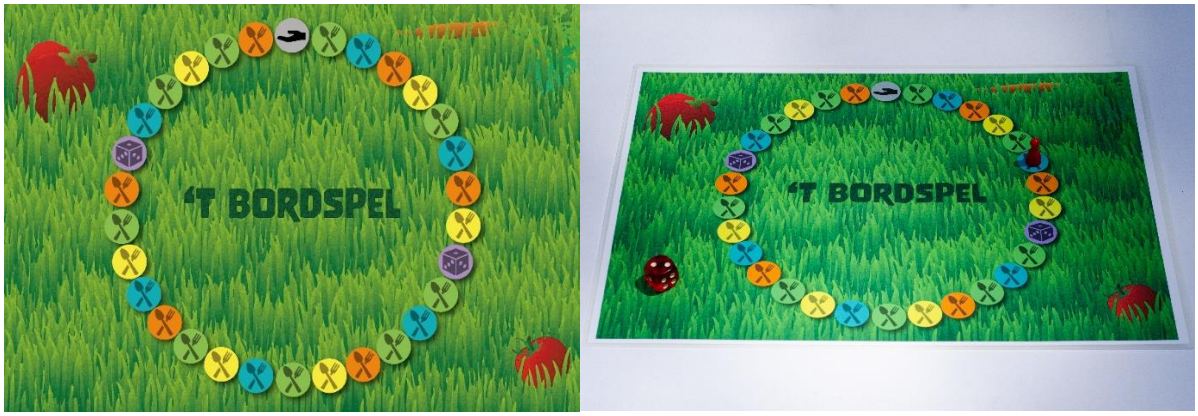


Figure 35: Boardgame layout
Figure 36: Boardgame Layout prototype, placemat with die and pawn

5.3 Plate

Multiple sections of the plate were 3D printed so that they could be switched out if more types of food were cooked. The green section is meant for vegetables, the blue for proteins and the orange for carbohydrates. The yellow section can be used for an extra type of food. If the yellow section is not used, the yellow spots on the board, meaning the child can pick which food to eat. Placing food on these sections corresponding to these types of food is not necessary but recommended so that the ratio of coloured spots on the board game matches the amount of food to be eaten. The bottom plate is used to hold the sections. This plate is shown in figure 36.

Figure 37: 3D printed plate

5.4 App and Phone box

A phone box was made to go with the app. By having a box for the phone, the phone becomes part of the game instead of it being a phone at the dinner table (figure 37, 39). Besides hiding the phone, the box is also used as a type of phone protector during dinner time. A sponge was stuck inside the phone case, to protect the phone (figure 40). The theme of the phone box and app corresponds to the theme of the board layout, namely grass and growing vegetables. The app has a button with 'Ik Heb gegeten' meaning 'I have eaten' in Dutch. When the button is pressed, random animation is played whereafter the app returns to the start screen (figure 38).

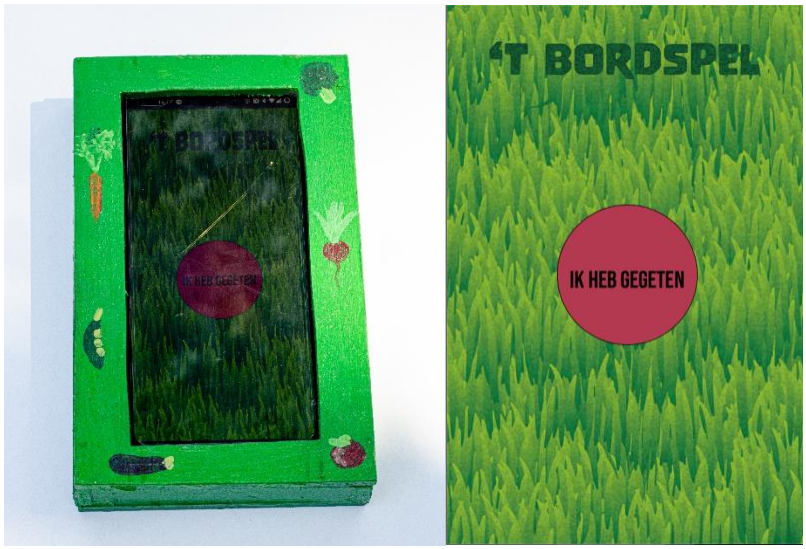


Figure 38: Phone box with an app
Figure 39: Screenshot of the application start screen

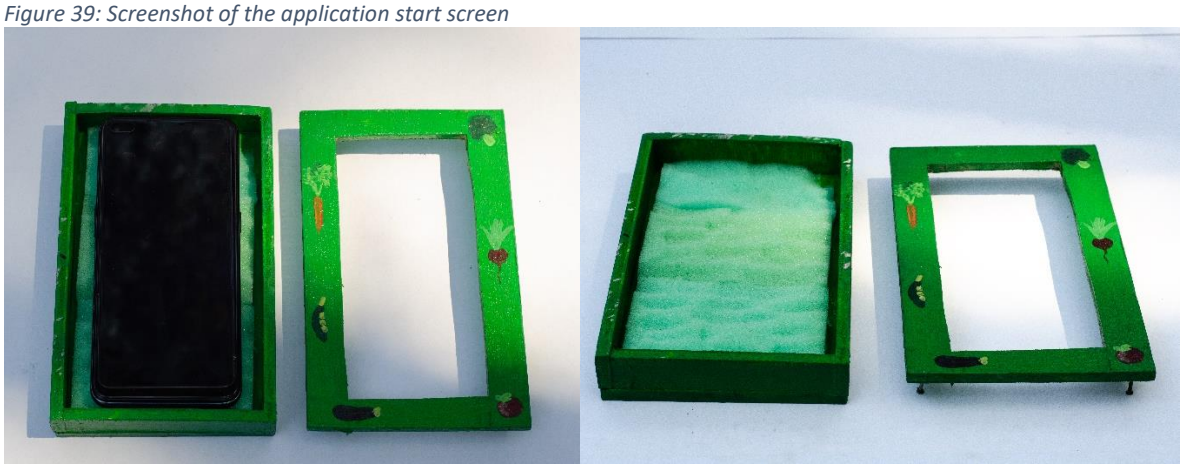


Figure 40: Phone box open with phone
Figure 41: Phone box open without phone

5.5 Complete Setup

The complete game setup with phone box, board game, plate, die and pawn are shown. The game can be played in two ways: with the board game as a placemat beneath the plate (figure 41) or separated (figure 42).

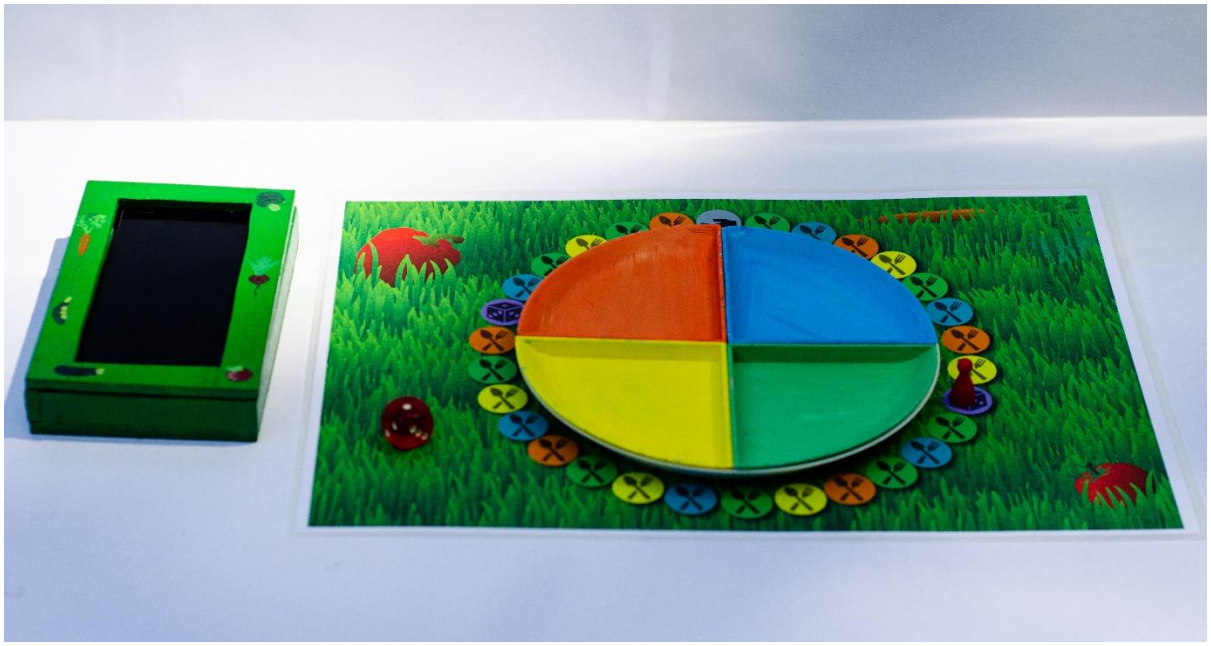


Figure 42: Complete board game setup with the board as a placemat.

Figure 43: Complete boardgame setup with plate separated

6. Evaluation

This chapter will evaluate the proof-of-concept of the developed product with participant interviews. How this will be done is explained in the method. The details of the evaluation are presented in the procedure. The results display the findings from the interviews.

6.1 Method

The goal of this evaluation is to test a proof of concept with the use of a high-fidelity prototype while additionally testing other functionalities. The goal of a proof-of-concept evaluation is to test if the prototype or product seems like a viable option to continue and further develop. Hereby meaning that the product is successful in changing the eating behaviour of children with ASD. A semi-structured interview will be used to determine the proof of concept. Based on the opinions of participants and common themes which are mentioned, the continuation of this product will be evaluated. The interviews will be transcribed and coded. Each interview will be discussed detailing the most important or reoccurring themes. The interviews will be coded in the following categories: social interaction between child/parent/game, plate, animation, boardgame layout, game mechanics, consensus about the product and what is a specific motivation for the child to eat. The categories such as board game layout, plate, animation, and game mechanics have previously established categories. The other categories were chosen through emergent coding. Before coding, the importance of some themes was unknown, which caused the additional categories to be added. After coding the information, it will be summarized and conclusions of all three interviews will be made.

The evaluation sessions will only be conducted with parents of children with ASD. This means that the game cannot be properly tested with the children and the game cannot be played with children. Since the goal of this evaluation is a proof-of-concept test, this is not very important. The interview will focus on introducing the prototype to the parents to receive their opinions and feedback. The usability test will introduce parents to the prototype and ask them to interact with the prototype. This will include asking them to complete a few tasks such as how the game is started, and certain game steps to check if the game explanation is understandable. With the other interview questions, user satisfaction with each independent element of the product will be questioned. This can indicate which parts of the product need to be improved.

6.2 Participants

Parents of children with eating difficulties were contacted through the clients. Many parents were contacted of which five parents were willing to pass on contact details to the researcher. Of these five parents, three mothers accepted participation. Three mothers with children who had eating difficulties were contacted. The children were aged 3, 7 and 8 years old. None of the children had ASD and therefore did not fall within the user group this product was made for, but feedback from these parents was nevertheless useful.

6.3 Procedure

Interviews were conducted in the home setting of the participants. This causes participants to feel more at ease while being interviewed. The threshold for the participant to participate is therefore also smaller because they do not need to travel.

The user tests were held in person with distance and following the government protocols concerning covid-19. The researcher took a self-test before travelling to the participants home, as well as keeping a 1.5-meter distance from the participant and wearing a mask at all times. The prototype was additionally disinfected before testing was done.

6.3.1 Interview structure

The interview will be held in Dutch, to make the interviewees feel more comfortable and therefore receive better feedback. The interview will be semi-structured, using some questions to lead the discussion. The questions used in this interview have been based on literature [36], [37].

The participants should be reassured that they are not being tested but that their feedback and help is needed to improve the product and/or continue with the product. This should be said to encourage them to share their criticism. The main idea will then be explained. The following questions will be asked:

1. Do you have any questions about how the game works?
2. Does anything confuse you?

These questions help with understanding if anything about the description is unclear or needs to be improved. The user will then be asked to perform a few simple tasks with the prototype:

1. How would you start the game?
2. What would you do next?
3. How would you explain this game to your child?

After the interaction with the prototype is completed, the following questions will be asked in a semi-structured way to get the general opinion about the idea:

1. How do you think this idea could contribute to the eating behaviour of your child?
2. How would you use this game to help the specific food-related difficulties of your child?
3. What do you like about this idea?
4. What do you wish it could have?
5. What would you want to add to this idea?
6. What would you want to remove from this idea?
7. What do you think your child would think about this game?
8. Would your child think the game was boring after a few tries? Why?
9. What is the difficulty level of this game for your child in your opinion?
10. What frustrates you about the product?
11. How would this game fit within your family mealtimes?
12. Which methods have you previously tried to change the eating habits of your child?
13. Is this game comparable to anything else you have tried? So yes, what?

More questions about specific elements of the game will thereafter be asked:

<u>Plate</u>

1. What do you think when you view the plate?
2. How would this contribute to the game?
3. What would you change about the plate?

<u>Animation/phone</u>

1. What do you think about the animations?
2. What other animation topic would you want to see?
3. What would you change about the animations?
4. How do you feel about using your phone within the game?

Boardgame

1. What do you think about the board game layout?
2. What would you change about the board game layout?

End

1. Do you see yourself using this game?
2. What would you grade this idea from 1 to 10?
3. Do you have any final questions?

During the interviews, the questions will most likely be changed according to what the participant has already answered, or new questions will be added. The questions stated above are only a structure to fall back on. The interview structure can be found in Dutch in Appendix G.

6.4 Results

The results of the interviews will be presented per participant. Each interview will then summarize each participant's observations and opinions per code category. Common themes, observations and opinions will be noted in the conclusion of this chapter and further discussed in the next chapter.

6.4.1 Interview 1

The first interview was with a mother who had a three-year-old child with eating difficulties. The child had difficulty with food but was not autistic. Currently, the parents were using various methods to motivate their child to eat, like cheering and high fiving after they ate a bite.

Consensus

The participant mentioned that their child loved rolling a die and it was a good part of the game. They did not see themselves using the game every day though. They felt like it would be fine to use once or twice a week, but not more than that. They did seem positive about the use of the game if there were some previously mentioned alterations. P1 suggested the use of more progress tracking in the game for example a type of sticker collection in the app. They estimated the success rate of the game with a 7 out of 10. It was questioned what would happen if they only ate one thing, like pancakes. They said that it would then become annoying.

Interaction

The interviewee felt that the board game concept missed the interaction between the parents and the child. They thought it would be better if everyone had a plate or if there were special places which gave interactions between parent and child, like giving a high-five, doing a happy dance, cheering or that one of the parents makes a funny face. They also thought that if everyone participated at the dinner table the child would more likely participate.

Animation

The use of animation was seen as a good motivator, but the interviewee thought that it should not be about food. They thought that the theme of the animation should distract from the food with sounds and a different animation genre possibly corresponding to the preference of the child. The mother thought that their child would be annoyed if they only saw videos about food. The food alone already causes a lot of tension, so the video should not be about food. It would be better if it was educational with counting or shapes. They recommended the app 'Bimi-boo' as a reference for how it could be. The participant also thought that the animations could be more difficult, for example asking questions and such.

Plate

The participant thought that the plate was clear, but that the colours were too bright. They recommended only showing colours on the rim of the plate so that it would not be too overwhelming for the child. They also questioned if it would not just be better to have two separate plates where the sections were connected.

Boardgame Layout
The participant felt that the colour of the board was too dominant. It should either be a very light green or a blue as to not overwhelm the child. They said that children are very aware of dominant colours and having a board game like this might distract them too much.

6.4.2 Interview 2
A mother was interviewed who had a 7-year-old child with eating difficulties. The child did not have ASD but still struggled with food. The parents just started a course to improve the eating behaviour of their child. The mother also preferred to not give rewards to the child for eating. Currently, the parents are trying to be consequent in not giving the child treats if the child does not eat their dinner. Her daughter was supposedly motivated with rewards and stickers or by watching a YouTube video.

Consensus
The participant liked the concept and thought it was a good idea, but that it should be improved. They did not think the animations would motivate their child enough to eat. They did want to try out the game but expected that their daughter would be bored of it after three tries. They did expect the game to work for younger children.

Interaction
The participant saw themselves using the game, but not as a one-player game. They said they would implement it by just having multiple pawns, and everyone would go in turns. There would then be a winner for who got to the end first. The participant wanted more interaction between the child and parents during the game.

Animation
The participant did not think the animation would be enough reward to motivate their child to eat. She did give another idea, which she thought would work better: "*I think I would make an app with when every time my daughter eats a bite, she would get another piece of a puzzle or so and then when she has eaten all the bites, she can put the puzzle together, or that the puzzle becomes a video. So that the player does not watch an animation after every bite but instead would receive a compliment and puzzle piece.*" She also suggested saving up puzzles like a type of sticker book. The participant also asked if it would be possible to have different animations per age category.

Plate
The participant thought that the use of the primary colours would be better because the primary colours are often used for teaching young children. They also thought that having the whole plate coloured may be too much for autistic children. They advised to only have the rims of the plates coloured or to use a sticker.

Boardgame Layout
The participant thought that there should be some changes to the board layout. "*Maybe you should add more which is for the benefit of the child because they are allowed to give away a bite when they finish a round, but maybe that it should be more frequent.*" There should be more interaction or special spots on the board. They also said that the background should be calmer, that it was too green. That the spots would then be clearer with a calmer and lighter background. The participant also questioned if it would be better to have more shortcuts and passages in the board layout. They said that their child would prefer that, but maybe it would not be good for children with ASD.

Game mechanics
The participant thought that it may be better to use a die with coloured spots instead of numbers. She did note that it may be better for younger children but that for older children a die with numbers was good or that children should be given the choice of a die.

6.4.3 Interview 3
A mother was interviewed who had an eight-year-old daughter with eating difficulties. The daughter would not eat any vegetables or fruit, only potato puree, bread, and sweets. In the past, the parents were advised to pressure their child to eat, which had a contrary effect. Now they are just trying to be

patient and their daughter is slowly trying new foods again. The best method for their daughter at the moment is to be consistent, rewards and social motivation from other children does not help.

Consensus
The participant thought it was a good idea and that her daughter would like to try it. She did think the game would have to have foods that her daughter liked as well as disliked. She said that the game should be introduced with only foods which her daughter liked and that it should gradually be changed to foods which she disliked. The participant thought the game was at the right difficulty level because eating the food was already difficult enough. She gave the chance of the game working an 8.

Interaction
The participant thought that if they used this game, they would play it together with their child. Every player would have their pawn and would take bites. The participant said that they would then also add food which they did not like so that their daughter would also know that it was difficult for her parents. She said that she would introduce the game with a mix of some foods which the child liked and others that she did not.

Animation
The participant liked the animations and thought it was an interesting subject for children. She thought the animations were at the correct thinking level for her child. She noted that it might be good to play some animations on how to smell or taste the food.

Plate
The participant noted that the sections were not that important for her daughter, but that she understood it could be necessary for children with ASD.

Boardgame layout
The participant thought it would be better if the child could give away a bite more often during the rounds. She also mentioned that the background of the board was too busy: "*I think it would be better if it was an even colour, the blades of grass could be very distracting.*"

6.5 Conclusion

All three participants were positive about the concept. They liked the idea of eating from a certain section after landing on a spot. Two out of three participants did however not think that the animations would be enough reward to motivate their child to eat. They both suggested having a different animation theme with interaction. Examples were given where the children would drag objects on the screen to create a complete picture. All participants also felt that there should be more interaction between the child and parents during the use of the game. They all wanted to be able to use the game together either with separate plates and die or sharing one plate and die. Participant 1 (P1) suggested the use of surprise cards between animations or app interactions, which the parents would have to do, like 'Dad should make a funny face' or 'Mum should do a victory dance'. There seemed to be a need for more progress within the game. Two participants also thought there should be more 'give a bite away' spots, which would be for the benefit of the child.

All three participants thought that the board layout background should be changed. Two participants specifically said that the background was too green and should be changed to a calmer colour. The third participant noted that having so many blades of grass could be distracting for children and it would be better if it was an even colour. Two participants seemed uncertain about where the start position was. P2 also noted that a die with coloured spots may be better for younger children.

Two of the three participants thought that the plate sections should not be a full colour, but only a sticker or rim of the plate should be coloured. They explained that some children are triggered by eating from a coloured plate. P3 noted that it may be better to use primary colours for the plate sections as those were often used to educate children in primary school.

7. Discussion

How can gamification, playification, or/and technology be used to change the eating behaviour of children with Autism Spectrum Disorder? A prototype was designed to test if the eating behaviour of children with ASD could be changed to a certain extent. The prototype was then tested which received various feedback to improve the product. The design of this prototype showed the possibility of using gamification, playification and/or technology with known strategies[4] to change the eating behaviour of children with ASD. However, this prototype was never tested with parents of or children with ASD. The evaluation of this prototype can therefore only lead to further developments of this product. There are many possible solutions to changing the eating behaviour of children with ASD. In this graduation project, one of the many possibilities was chosen to focus on. There may be better, more efficient methods. Only assumptions can be made about the effectiveness of the product.

Background research was done to understand the problem attempted to be solved. This led to several product requirements which were used to start the ideation process. The ideation process developed several ideas, and a combination of two ideas was continued. Many design choices were then made to create the prototype whereby the teaspoon method was integrated with a type of food board game. This product was then evaluated to gain more insights into product improvements and how the goal of changing the eating behaviour of children with ASD could be reached.

7.1 Current Methods

What interventions concerning the eating behaviour of children with ASD are used? The teaspoon method is one of the interventions currently used to help change the eating behaviour of children with ASD. The teaspoon method [4] was integrated into the product in a game-like manner. The teaspoon method utilises positive and negative reinforcement to encourage the child with ASD to eat. Teaspoons of food are offered to create a small threshold for the child. Within this method, it is important that eating is still seen as a normal practice and that children do not receive large rewards for eating. The product developed in this product makes use of this. Positive reinforcement is implemented by showing short animations after each bite. However, negative reinforcement is not fully applied. This could still be adjusted in further developments of the product. A possible option would be to make the player go back a step if the food is not eaten. Food is also offered to the child in teaspoons to decrease the threshold. The teaspoon method is introduced by a paediatrician to decrease conflict between child and parent. This product also has the benefit of decreasing conflict since the child can blame the game instead of the parent for having to eat. The degree to which eating is a normal practice is implemented in the product is questionable. The product has been designed with this idea in mind but has strayed from the goal. Implementations such as making funny faces, dances and games during mealtimes do not fit within the ‘eating is a normal practice’ idea.

What are current products related to Autism, eating and/or children? Currently, picky eating applications, fun plates and kitchen appliances are being used to help children with ASD eat. Food exposure was used in many previous methods [28]–[30] to help children overcome difficulties with food. This was also implemented in this product, however when evaluating the product parents thought this would have a contrary effect. Two participants mentioned that they expected their children to be annoyed if they had to watch animations about food as well as having to eat the food. They said that this type of food exposure would be effective if shown at other times outside of mealtimes but not during. This result should have been anticipated since the food exposure methods were indeed used outside of mealtimes.

Social support was also applied in various applications and methods [38] (Appendix B, Playte together). In the product, this was implemented by giving a bite away at the end of each circle. The benefit of social support was in line with the findings. Social support should have been further implemented as was seen in the evaluation. All participants wanted to have more interaction with their children during the game play. Recommendations made were, like adding more giving-away-a-bite spots, cheering/high-fiving their child after a certain number of bites and playing together. How exactly this could be added to the game, would need to be tested further.

There are various examples of playful plates used to combat picky eating (Appendix B, Playful plates). This was used as inspiration for the board game. The plates made use of physical boundaries to keep foods separated, colourful images, rolling a die and giving the child choices. In the developed game, physical boundaries, rolling a die and giving choices was also implemented. Having colourful illustrations were advised against during interviews [32]. Although, the plate sections in the product were still coloured. From the evaluation, it was found that a full coloured plate section could also be triggering for children with ASD. This could be adjusted to coloured rims.

Applications have been used to tackle difficulty with food (Appendix B, Applications). Gamification was also used in these applications. Technology has also been noted to increase the attention span of children with ASD [19]. This is in line with the findings of using an app. The evaluation determined that children saw watching a YouTube video or interacting with a screen as a reward. Using an application in addition to the board game should therefore still be continued. How and what exactly the application should show to be used as sufficient motivation for the child to eat would need to be further tested.

It should be noted that the evaluation with the stakeholders was not in line with that of the parents. The stakeholders thought that the product should not have many more implementations than it already had. They argued that parents often think they need more than they do. The stakeholders commented that the goal of this product is to break an eating habit instead of entertaining the child. This difference in opinion could also be due to the majority of the parents having children who are older than the target group. This means that they expect their children to want more challenges within the product.

7.2 Future Research

There were a few common themes within the evaluation which should be adjusted for further development:

- Board layout: The colour of the placemat was seen as a too dominant colour and should be changed to a more calming tone such as a light blue. The background should also not show blades of grass, as this could be distracting for children with ASD.
- Plate: The coloured sections of the plate should not be fully coloured. Children with ASD may have difficulty eating different coloured foods from different coloured plates. An adjustment could be to only colour the rims of the plates.
- Animation: The animations created for this product, were expected to not be motivating enough for a child to take a bite of food. These animations should be adjusted with a different theme which is not food. A food theme was seen as too overwhelming when the child is also busy with eating food.
- Interaction: There should be more interaction between child and parents, the best way to do this is still unclear. Some suggestions were to have surprise cards where parents would make a funny face, or high-five their child. Another possibility would be to have multiple plates or pawns so that parents and children can play at the same time. There should also be more give a bite away spots.
- Progress: All participants said that they expected their child to be bored of the game if played more than twice a week. This was due to limited tracking of long-term progress or progression. The game would stay the same even when the child progressed with eating. Therefore, it would be recommended to add more gamification features to the app, such as rewards. A possibility would be to have different levels of animations shown. That after a certain number of successful mealtimes, a new theme of animations was introduced or a different type of game.

There were many more suggestions and possibilities on how to improve this product, but these were common comments with all three participants, so it should be looked at in more detail. Other suggestions or observations made were to improve the start position, to use primary colours and to

give the option of using a die with coloured spots instead of numbers. The use of sound or music in combination with animation has not been properly researched. The decision was made to not use sound as it could be disrupting during mealtimes. However, the absence of sound was later questioned. The relation between sound and motivation should be further researched.

How the product was tested could be improved, by increasing the number of participants, and having children test the product. This can give a better idea of how the usability of the product is. The evaluation could have been improved by only asking parents with children in the target group. Other than that, the evaluation gave a sufficient proof of concept.

7.3 Limitations

Generalizability remains a demanding objective when designing for individuals with cognitive impairments or other disabilities [39]. Research states that when designing for these individuals it is advantageous to test the product on a large group of individuals. Generalizability can then be attempted with details that cover this large group. Preferences amongst these people can then be implemented as personal customization within the product. During this product evaluation, only a few individuals were tested and therefore generalizability is near impossible to attain. As seen, there were even then many different preferences within the three participants.

The reliability of the evaluation is also questionable since none of the parents was in the target group. None of the children fell within the age group as well as none of them having ASD but they did have difficulty with food. The participants interviewed were only consisted of mothers, it may be that fathers have a different view or opinion on the subject. However, the results from the evaluation do give a sufficient indication as to what would need to be improved in the product. At this stage in the design process of the product the interviews with parents of children with eating difficulties, to know in which direction there would need to be an improvement. Testing the product with children would still need to be done, but only after continuing product improvements. At this point of evaluation, there is also no longevity of the study since the number of participants interviewed is minimal. Additionally, the product was not tested on children, so the effectiveness of the product cannot be determined.

When designing this product there may have been some unknown design choice bias. Design choices within the specialisation phase have been attempted to be as objective as possible with corresponding argumentation. It could however still be that decisions were made, which were not correct. This has also been seen after the evaluation sessions, such as the animation theme should not have been about food. There may be other decisions made that were not the best option but have been looked over. The wrong conclusions may also have been made after evaluation. Even though, the goal was to make the best decisions and most accurate conclusions.

8. Conclusion

Some characteristics of the eating behaviour of children with ASD are the preference for low textured foods, tactile sensitivity, appetite inhibition, High-Frequency-Single-Food-Intake, an atypical response to taste and a preference for their foods not touching. Besides the difficulty, these children have with food it also causes stressful situations for parents at mealtimes. There are known interventions such as the teaspoon method which systematically try to change the eating behaviour of these children. However, these interventions are often difficult to implement and introduce to parents. By following the Creative Technology design process, a product was developed that can be used as an example for the use of play in combination with behaviour change interventions. The product presents a possibility to implement gamification, playification and technology to change the eating behaviour of children with ASD.

This research shows that the use of coloured plate sections in combination with a board game could be a viable option for changing eating behaviour. Using luck-based elements in a game to encourage eating certain foods could reduce conflict situations between child and parent. The child can blame the game for having to eat instead of their parents. This research does however raise the question of how to motivate a child with ASD to eat. Animations relating to food are not expected to persuade the child sufficiently. Food exposure from food-themed animations could be used to improve a child's familiarity with food outside of mealtimes. The use of interaction and social play with regards to motivation should be further researched for children with ASD.

While the limited number of participants does limit the generalizability of these results, this product does provide new insights into how the product can be improved. Future research should focus on how animation can be utilised to increase the motivation of children to eat. This research development project shows a new method of using play and technology to reduce conflict situations for parents and the possibility of changing the diet of children with ASD.

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9.2 Image Sources

Figure number	Description	Image Source
Figure 1	Food Face Dinner Plate	https://www.amazon.com/Fred-Friends-Ceramic-Dinner-Plate/dp/B001YHQU7U/ref=as_li_ss_tl?s=aps&ie=UTF8&qid=1472010552&sr=1-1-catcorr&keywords=fred+funny+face+plate&linkCode=sl1&tag=whatmomslove-20&linkId=536ab5324ff1eb52f2171a6d3416b097

Figure 2	Playte Adventure	https://playte.co.uk/product/playte-adventure/
Figure 3	Fred's Dinner Winner Dinner Tray	https://www.amazon.com/gp/product/B01D1FSJXA/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=motherly01-20&linkId=85f1e610ba1382b6e94511d37723ca31&language=en_US&th=1
Figure 4	Playte Together	https://playte.co.uk/product/playte-together/
Figure 5	Constructive Eating Dinner Plate	https://www.amazon.com/Constructive-Eating-Garden-Utensil-Placemat/dp/B008DHA8WM/ref=as_li_ss_tl?ie=UTF8&qid=1488326134&sr=8-28&keywords=picky+toddler+feeding&linkCode=sl1&tag=semidelicbala-20&linkId=8919dc1588a2ef1305a8f05e79baa559
Figure 6	The Food Explorer Club	https://apps.apple.com/us/app/food-explorer-club/id1481324407
Figure 7	When To Wonder: Picky Eating app	https://www.healthline.com/health-news/new-picky-eater-app-helping-parents
Figure 8	Learn Play Eat	https://www.chartoo.in/itunes/app/1377533159-learn-play-eat
Figure 9	Tiny Tastes app	https://apps.apple.com/us/app/tiny-tastes/id926928170
Figure 25	Perfect portion plate with 4 sections	https://nutritioneducationstore.com/products/portion-plate-portion-control-plate-for-diet-and-exercise-success?variant=20070589763
Figure 26	Foodbank portions with 3 sections	https://www.superherofoodshq.org.au/product/portion-plate/

9.3 Image sources in board Layout

Dice icon	https://iconarchive.com/show/windows-8-icons-by-icons8/gaming-dice-icon.html
Knife and fork	https://thenounproject.com/term/eat/18394/

10. **Appendix**

Appendix A: Literature Review – Academic Writing

Current Approaches to Change the Eating Behaviour of Autistic Children: Literature Review

Elsi Muller - 2021

Introduction

Children with Autism Spectrum Disorder (ASD) often have difficulty interacting with food. This can include food refusal, food selectivity or high-frequency single food intake [1]. These children regularly experience a food refusal phase. The difference between autistic children and typically developing (TD) children is that repeated exposure to certain food types is not effective. If this food selectivity is not alternated within a balanced diet, then it will often remain unchanged through adulthood. Autistic Children, therefore, have a significantly lower intake of necessary nutritional substances such as calcium, protein, and vitamin D [3]. Additionally, there are many differences between the eating behaviour of ASD children and those of TD children [40] and the interventions currently available to support the first group are not always appropriate or effective [1]. It is therefore important to gain more insight into the eating

behaviour of autistic children. Which approaches are currently used to change the eating behaviour of autistic children? By researching which current behavioural approaches and implementations are being used to change the eating behaviour of autistic children, and comparing these to available technologies, new combinations could be developed which could create a breakthrough. In this literature review, common problems concerning the eating behaviour of autistic children will first be addressed, followed by known behavioural approaches, before noting the implementations these behavioural approaches have been applied to.

The search strategy used, included the following terms: 'Autistic Children Eating' OR 'Game Eating Autism' OR 'Game Eating' OR 'Teach Autistic Eating' OR 'Autistic Children eat' OR 'Spectrum Diet' OR 'Intervention Spectrum Eating' OR 'Nutrition Autism' OR 'Food Autism' OR 'Support Autism' OR 'Behavioural Approach Autism' OR 'Behavioural Approach Spectrum' OR 'ABA Method Autism' OR 'DIR Method Autism' OR 'PECS Method Autism'. These search terms have all been used on 'scopus.com'. Studies included in this review were based on Children with ASD with an age range from one-year-olds to 14-year-olds. Most of the articles chosen were based on eating and diets related to children with ASD, although several were added if valuable, to considering additional theories and approaches.

Literature review

Differences in Eating Behaviour between Autistic Children and Typically Developing Children

The difference in eating behaviour between TD children and children with ASD is important to define. Food selectivity is the most prominent difference. This food selectivity in children with ASD can include limited food repertoire, food refusal and restricting food intake to a few frequently eaten foods [9]. Vegetables are most consistently rejected by children on the spectrum, compared to TD children (Bandini et al., 2010). Food selectivity is often based on the sensory aspects of the food. Autistic children essentially selected low textured foods or foods that had been pureed [10]. Refusal to eat certain foods typically related to foods that required a great deal of chewing. This is allegedly due to the developmental delay in tactile sensitivity, sensory-motor functions, and an atypical response to taste in children with ASD [9]. This makes their choice of preferred foods limited, and therefore difficult to accommodate. Children with ASD additionally do not perceive visual and auditory information similarly to typically developed children [11]. Children with ASD often did not like foods physically touching each other [9]. Foods would also be rejected due to temperature, texture, taste, and smell [11]. Besides the sensory aspects, the food often had to be prepared in a certain way, for example, only eating fried foods [10], [12]. High-frequency single food intake (HFSFS) is often noted as an aspect of ASD however Bandini et al. (2010) acclaimed that HFSFS has rarely been tested in TD children. Other aspects of children with Autism are that they often have no intrinsic motivation to eat and often have appetite inhibition [13]. This means that the children do not recognise the feeling of hunger [4]. Food selectivity, appetite inhibition, intrinsic motivation to eat, food proximity and means of preparation appear to be the main differences between the eating behaviour of children with ASD and TD children. Behavioural approaches can be more easily understood when characteristics of the eating behaviour of children with ASD are also considered.

Current Behavioural Approaches to help Autistic Children

There are several types of behavioural approaches concerning the eating behaviour of autistic children. Firstly, Turner et al. (2020) make the distinction between intrusive and non-intrusive methods. Two intrusive methods which are mentioned are Non-removal of the spoon (NRS) and representation of expelled foods (RP), these methods are mostly used together. NRS is when a quantity of food is held near a child's mouth and not removed until swallowed. Representation of expelled foods consists of re-serving foods which have previously been rejected. These methods are named as part of 'escape extinction': caregivers persist in re-presenting the food until the child has eaten it [1]. Both Van der Gaag & Snijders. (2017) and Turner et al. (2020) reference Piazza et al. (2003) when mentioning escape extinction. Najdowski et al. (2008) determined that escape served as negative reinforcement and suggest in contrast to Piazza et al. (2003) that inappropriate mealtime behaviour is encouraged with negative reinforcement. This is noted to be due to unintended use of positive adult attention and supports the functional analysis of Piazza et al. (2003) in producing false-positive results [15].

Positive approaches were also tested. Van der Gaag & Snijders (2017) mention the benefit of using both positive and negative reinforcement. Positive reinforcement is when a reward is presented after the preferred behaviour is accomplished, this increases the likelihood of the action happening again. Negative reinforcement works by removing an unpleasant future event after the desired behaviour is shown [4]. Escape extinction does not seem to be an effective behavioural approach, where the use of positive and negative reinforcement does.

Applied Behaviour Analysis (ABA) technique is a teaching tool based on positive reinforcement. It follows the principle that the desired behaviour is more likely to be repeated with the promise of reward, alongside a repetitive training process. This idea was formed by the theory of Lovaas (1987) where reinforcement is the key aspect of the treatment. In this research, it was stated that high rates of aggression should be ignored in a child, as this should reduce the aggression shown [16]. The ABA method is split into three steps: (1) the target task is instructed to the child, (2) the response of the child is monitored, (3) the child's behaviour is rewarded, or the child is prompted when necessary. The ABA technique focuses on teaching children with ASD about new objects or pictures which correspond to a word [17]. For example, asking children to select a picture card of a carrot to the word. Even though the ABA method is not directly correlated to the eating behaviour of autistic children, it can be implemented as an eating-related learning technique.

Lastly, Response Shaping is a behavioural approach that seems to connect the previously mentioned behavioural approaches. Response Shaping refers to the process where

the target behaviour is reached by continuously adjusting the procedure slightly while the stimulus or reward remains the same [1], [20], [21]. Response Shaping uses both positive reinforcement and the repetitive and monitoring aspects of the ABA method but does not make use of escape extinction. The key to using the above-mentioned behavioural approaches correctly is monitoring and adjusting. Rewards are adapted, when they are not effective, and approaches are changed. How these approaches have been adapted depends on the success of their implementation.

Current implementations of behavioural approaches to change the eating behaviour of Autistic Children

There are several implementations of the previously mentioned behavioural approaches to change the eating behaviour of autistic children. These include the use of positive and negative reinforcement, physical food transformation, and Response Shaping. The teaspoon method is an implementation of both positive and negative reinforcement with the basic notion that eating is the normal practice [4]. The teaspoon training program starts by presenting the child with one teaspoon of avoidance food. By making the eating threshold low, the child is more likely to accept the food. If they do not, an avoidance situation was used as negative reinforcement, such as going to bed early. Every month the parents had a separate training session with a general paediatrician. If the child were successful in eating the teaspoon of food, the amount of food eaten would be increased. It was important for the child to see the paediatrician as the responsible party, causing the conflict between parent and child to decrease. If the child failed, the avoidance situation was changed [4]. Vaz et al. (2011) tested the use of negative reinforcement by feeding the child a 'rejected' food if they did not eat the target food by themselves. This created the perception that the target food was a superior choice and the acceptance rates of eating the target food improved [22]. Van der Gaag & Snijders (2017) combined positive and negative reinforcement even though positive reinforcement alone delivered negative results. The use of positive reinforcement was used by then feeding the child, a piece of their preferred food after eating the target food. In this pilot study, the use of positive and negative reinforcement was successful in changing the eating behaviour of autistic children. This intervention can be implemented by parents or guardians even though it takes some training and persistence. The Teaspoon method appears to be the first intervention of its kind implementing both positive and negative reinforcement in changing the eating behaviour of children with ASD.

Another implementation is the use of physical food transformation with a focus on the sensory-motor functions of autistic children. Kim et al. (2018) researched the influence of vegetable exposure on the eating behaviour of children with ASD. Over six months, pre-schoolers participated in 'craft' activities involving vegetables. Results showed a significant increase in the exposure group in consumption and touch compared to the control group [23]. The idea of improving vegetable and fruit exposure in a 'playful' way was further researched by Chung et al. (2020). Chung et al. (2020) performed a study where fruits and vegetables were transformed to enhance the sensory approval of autistic children. Previous studies determined a relationship between the eating behaviour and sensory processing of children with ASD [24], [25]. The physical appearance of food samples was altered, which may also have changed the temperature and texture of the foods [11]. After a month of eating the same foods in a different appearance, the acceptance rate of the previously rejected food increased. The modifications to the food influenced the tactile, smell and taste sensitivity of children with ASD due to neurological changes. The increased exposure of the same food in a preferred transformation increased the acceptance and future consumption of fruits and vegetables. These foods were often transformed into crisps, as the crunchy texture was more appealing [11]. Changing the physical appearance of food samples seems to be a novel method of increasing food exposure and therefore changing eating behaviours. In contrast to Chung et al.'s (2020) goal to increase the food range preferences of the child, Yamane et al. (2020) only analysed them. Yamane et al. (2020) examined how to support children with ASD in the types of foods served. They characterized how a child selected their food and then separated the children into three groups. The first group was identified by touch and texture, the second group selected foods based on visual factors and the third group mostly chose familiar foods. The study focused on changing their lunchtime diets over three years, by finding recipes and foods corresponding to their preferences but with a slight adjustment. By analysing their eating habits optimal support strategies could be selected. Support strategies included preparing foods that the child prefers while cultivating the child's curiosity to try new foods by touching or licking them. Yamane et al. (2020) monitored the child's behaviour to find food options that most corresponded to their liking. It was also noted that using the assistance of friends in supporting the child's cognitive and social development, their eating behaviour improved [26]. It is important to note that, Yamane et al. (2020) does not actually improve the food range, and this can therefore not be classified as behavioural change implementation. However, the importance of analysing and monitoring the child's preferred eating behaviour and how this can be integrated into other interventions is important.

In the third implementation, the use of Response Shaping when monitoring the child's eating behaviour is a key part. Hodges et al. (2017) presented avoidance foods to two participants sequentially. The next food was not tried till mastery of the previous food was accepted. After each successful bite, a reward was received [20]. In contrast, Penrod et al. (2012) presented avoidance foods simultaneously. Neither of the two studies was noted as more effective than the other. Turner et al. (2020) continued this research by comparing the use of a small food set with a large food set. In the small food set, the same three types of food were presented and with the large food set a total of 15 foods were presented (switching between different foods per session). Before the target behaviour of eating was attempted, the target behaviour was either touch or licking. This created a familiarity with the food. If the participant followed the instructions within the allocated time, verbal praise would be given, and their reward would be received. If they did not follow the objective the researcher would

pick up the food and show what the objective was, for instance, by touching the food to the participant's hand or tongue. The child would then again receive social praise [1]. The way Response Shaping was used by Turner et al. (2020) achieved a much shorter amount of time to complete behaviour change goals than Hodges et al. (2017) and Penrod et al. (2012). In summary, the use of small or large food sets and presenting food simultaneously or sequentially does not seem to make much difference in changing behaviour. However, using sub-goals like touching or licking and positive reinforcement does. Using physical food transformation as well as touching or licking foods is a beneficial way of increasing food exposure. Thereby using positive and negative reinforcement while monitoring the child's eating behaviour seems to be a key part of successfully changing eating habits.

Limitations

There are several limitations to the studies discussed. Foremost, it is difficult to make a distinction between behavioural approaches and implementations. Therefore, the distinctions made may be biased or incorrect. These distinctions were made to characterise elements of interventions so that they could be integrated into future interventions. Besides the structure of this review, the limitations of the following studies should be noted. Turner et al. (2020) state that variability in success between participants was substantial. Tests were held in a clinic to increase generalizability, yet it is difficult to know if the implementations would work at normal mealtimes. The same is the case for many of the other studies [14], [20]–[22]. In contrast, the teaspoon method could easily be conducted by caregivers after receiving instructions on how the implementation worked. The teaspoon method however does have its limitations due to it being a pilot study, using a small research group, and not using random assignment of participants. This intervention was also reliant on the participation of parents or guardians. The question is also raised whether only parents who were satisfied with the intervention took part. Most of these studies have been measured for 4 months or longer [1], [4], [11], [26]. Due to the long duration of these studies and the small sample population [11], [20], [21] it is difficult to generalise many of the findings. Additionally, the causes of selective eating habits vary widely, and it is, therefore, difficult to find an intervention that fits each child.

Conclusion

In conclusion, there are many approaches to changing the eating behaviour of autistic children. Food selectivity, intrinsic motivation to eat, food preparation and appetite inhibition can be changed with the help of behavioural approaches and implementations. Positive/negative reinforcement, Response Shaping, and the ABA technique are all beneficial in affecting behavioural change. Adversely, it has generally been determined that escape extinction is not effective in changing the eating behaviour of children with ASD whereas the teaspoon method and physical food transformations have been successful examples. The method by which food exposure is implemented is the common factor in all current implementations and the use of positive and negative reinforcement seems to be crucial in changing behaviour. By consequently monitoring the eating habits of the child, each implementation can be adjusted according to effectiveness per individual child. With advances in technology, new ideas implementing these behavioural approaches are still being developed.

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Appendix B: Product evaluation

Physical food transformation

- **Sandwich stamping**
  These sandwich cutters transform food into bears to make the food more appealing.
  price: $9.99
  https://www.amazon.com/CuteZCute-Animal-Sandwich-Stamping-Cutter/dp/B00FO0OHAK/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=bfelizabeth-20&linkId=906b7bfa39c7dfb458c8ceeb61880a70

- **Vegetable cutters**
  With these cutters, food can be cut into fun shapes.
  Price: $6.99
  https://www.amazon.com/CuteZCute-Vegetable-Cutter-Butterfly-Mustache/dp/B00P2O5DJW/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=bfelizabeth-20&linkId=b8a43d15ad78f472d71d9db4e020fc16

- **Munchkin Silly Sandwich Cutter**
  These sandwich cutters cut the sandwich into animal shapes.
  Price: $9.99
  https://www.amazon.com/gp/product/B0076LAGQ4/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=motherly01-20&linkId=9e0ae329714f335f0048c8c74e6fee82&language=en_US

- **Vegetable Spiralizer**
  This product can spiralize any vegetable into long spiralled shapes.
  Price: $25.99
  https://www.amazon.com/Paderno-World-Cuisine-A4982799-Tri-Blade/dp/B0007Y9WHQ/ref=as_li_ss_tl?s=kitchen&ie=UTF8&qid=1472066339&sr=1-2&keywords=spiralizer&linkCode=sl1&tag=whatmomslove-20&linkId=4ca4f6121800c5460e2fb411e766bae2

- **VeggiChop Hand-Powered food chopper**
  This product chops vegetables by pulling on a cord. This could be used to help children with ASD interact with food.
  Price: $17.57
  https://www.amazon.com/Chefn-VeggiChop-Hand-Powered-Chopper-Cherry/dp/B004HFR2MS/ref=sr_1_4?ie=UTF8&tag=parentmap-20

Food dividers

- **Food Cubby Plate divider**
  These suction food separators can be stuck on any plate to keep foods from touching. It can also be used to help scoop food onto the child's spoon.
  Price: $14.99
  https://www.amazon.com/Food-Cubby-Plate-Divider-PACK/dp/B01FGS9ZIS/ref=as_li_ss_tl?dchild=1&keywords=food+cubby&qid=1591053443&sr=8-1&linkCode=sl1&tag=motherly01-20&linkId=4d7924db29da38ac78fd9ef094c94c73&language=en_US

- **Ezpz Mini Mat**
  The Ezpz Mini Mat is a suction plate that also keeps foods separated.
  Price: $19.99
  https://ezpzfun.com/products/mini-mat

- **Silicone cupcake forms**
  Silicone cupcake cups are often used to combat food touching. It was also mentioned that cupcake cups are helpful to introduce new foods [27].
  Price: $7.99
  https://www.amazon.nl/Cupcake-vormen-herbruikbare-siliconen-bakvormen-muffinvormen/dp/B01N06C5W0/ref=asc_df_B01N06C5W0/?tag=nlshogostdde-21&linkCode=df0&hvadid=447089659602&hvpos=&hvnetw=g&hvrand=78334136416609367 4&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1010605&hvtargid =pla-389891093714&psc=1

Sensory Overload

- **What's in Ned's Head Game**
  A soft pillow head is stuffed with random silly objects and players must reach their hand in to pull out a certain object. This can be implemented to improve sensory exposure.
  Price: $50.40
  https://www.amazon.com/gp/product/B000096RFF/ref=as_li_qf_sp_asin_il_tl?ie=UTF8&camp =1789&creative=9325&creativeASIN=B000096RFF&linkCode=as2&tag=theinsptree0f-20&linkId=O2FXAOBDEQXRVN2B

- **Dr Blooms Chewable Jewels**
  Dr Bloom's chewable jewels are chewing toys made to look like necklaces and bracelets. This can be easily worn without attracting much attention.
  Price: $6.00
  https://www.amazon.com/Dr-Blooms-Chewable-Jewels-Rectangle/dp/B002WWPXII/ref=cm_cr_arp_d_product_top?ie=UTF8

- **Red Chewy Tubes**
  Chewy tubes are made for children to develop their oral motor functions. Children can practice chewing on a non-food surface.
  Price: $9.89
  https://senso-care.nl/chewy-tubes-bijtstaaf-rood?gclid=Cj0KCQjw4v2EBhCtARIsACan3nw0eEDTN3t6bNZMN-ND_eH_KwTTERDVcfNc6qOkILOlqYqJGbRwgkAaAoJOEALw_wcB

- **Chew Stixx pencil toppers**
  Chew STIXX pencil toppers can be placed at the end of a pencil to be chewed on. It has a bubble texture to improve sensations in the mouth.
  Price: $10.49
  https://senso-care.nl/sensory-university-chew-stixx-pencil-toppers-kauwdoppen-set-van-2?gclid=Cj0KCQjw4v2EBhCtARIsACan3nwlNNTLjdiiJBqjraSHwxfkSNJ-1DbhjJX7I7ddNScNFMPInzQzvUEaAouZEALw_wcB

- **Gonge Tactile disks**
  Gonge Tactile disks are disks that have different textures and are used to improve sensory discovery in children. When setting up a small sensory obstacle course before mealtimes the child is prepared for the sensory challenges of eating food.
  Price: $75.09
  https://senso-care.nl/gonge-tactiele-schijven-set-van-5?gclid=Cj0KCQjw4v2EBhCtARIsACan3nxijwTBMyC1UQfTg9jY47ELKXkKd4l5oqWgGnXRS Z885h8AZ81TkOYaAv7-EALw_wcB

Fun Plates

- **Food Face Dinner Plate**
  This is a ceramic dinner plate with a face on it. Food can be placed in such a way to

customize the face in a fun way such as adding hair, or a moustache.
Price: $15.95
https://www.amazon.com/Fred-Friends-Ceramic-Dinner-Plate/dp/B001YHQU7U/ref=as_li_ss_tl?s=aps&ie=UTF8&qid=1472010552&sr=1-1-catcorr&keywords=fred+funny+face+plate&linkCode=sl1&tag=whatmomslove-20&linkId=536ab5324ff1eb52f2171a6d3416b097

- **Genuine Fred Dinner Winner dinner tray**
  This is a dinner tray made in the shape of a map. Which has a small compartment for a treat at the end. It is supposed to motivate picky eaters to eat every compartment to get to the end.
  Price: $20.00
  https://www.amazon.com/gp/product/B01D1FSJXA/ref=as_li_ss_tl?ie=UTF8&linkCode=sl1&tag=motherly01-20&linkId=85f1e610ba1382b6e94511d37723ca31&language=en_US&th=1

- **SpinMeal Plate**
  This is a plate with 8 sections with a spin element in the middle. It should encourage picky eaters to try new foods by spinning the wheel. Each section has a depiction of an animal underneath.
  Price: $19.99
  https://www.amazon.com/Scandinavian-Creations-Spin-Meal-Plate/dp/B07GT834WP/ref=pd_bxgy_img_2/136-6582895-2294862?_encoding=UTF8&pd_rd_i=B07GT834WP&pd_rd_r=7f70e1c2-43b7-4b85-a271-e4c72384976b&pd_rd_w=lSvYv&pd_rd_wg=rhemv&pf_rd_p=fd3ebcd0-c1a2-44cf-aba2-bbf4810b3732&pf_rd_r=50ZZEF0592SJ8WTB2R7R&psc=1&refRID=50ZZEF0592SJ8WTB2R7R

- **Constructive Eating Garden Plate**
  This plate has a garden theme with 4 plate sections. Within the plate is a built-in ramp where children can push food up onto a spoon. The idea is to make the moving of food fun and improve the fine motor skills of the child. The separate sections keep the food separated for children who do not like their food touching.
  Price: $37.95
  https://www.amazon.com/Constructive-Eating-Garden-Utensil-Placemat/dp/B008DHA8WM/ref=as_li_ss_tl?ie=UTF8&qid=1488326134&sr=8-28&keywords=picky+toddler+feeding&linkCode=sl1&tag=semidelicbala-20&linkId=8919dc1588a2ef1305a8f05e79baa559

- **Playte Memory**
  This is an eating plate with paired images. Food can be placed on the images and the child must eat a piece of food on top of the image to reveal it. By eating the food they can make pairs. This is a gamified way of getting children to eat because children are curious to find the images underneath.
  Price: $19.99
  https://dinnerplayte.co.il/shop/playte-memory/?lang=en

- **Playte Adventure – Feed the crocodile**
  Playte Adventure – Feed the crocodile is a game on a plate. The child must move a piece of food as a pawn on the outer circle of the plate. By throwing the dice they land on a cell with different meanings. Some cells correspond to eating a piece of food from a certain section of the board or choosing one of the foods they prefer. When the child completes the circle, one piece of a spoon of food may be eaten by someone else. This plate has made a game out of eating. The downside is that foods can easily touch each other on the plate. The target group are picky eaters ages 4-8 but not specifically children with ASD.
  Price: $19.99
  https://dinnerplayte.co.il/shop/playte-adventure/?lang=en

- **Playte Adventure – Across the River**
  This plate game depicts barrels, rafts and boats on the water. The child must eat a piece of

food covering each of these objects to pave a path to the other side of the plate and thereby helping the tiger cubs cross the river. This plate game does have the possibility to become boring after a while since there is little reward included in the game.
Price: $19.99
https://dinnerplayte.co.il/shop/playte-adventure/?lang=en

- **Playte Adventure – Up the mountain**
  This plate game consists of a map with roads leading up a mountain. By rolling a coloured die, the colour of the path leads to the next piece of food. When eating a piece of food an image is also revealed. With this plate game, it is also the case that there is no use of reward when reaching the mountain.
  Price: $19.99
  https://dinnerplayte.co.il/shop/playte-adventure/?lang=en

- **Playte Together**
  Playte together is a two-player plate game. The plates connect with the images. The players must roll the dice to move to the next spot and eat a bite. By doing so they create a path to the middle. The player who reaches the path first by eating wins the game. This plate game makes use of competition and social play to encourage eaters.
  Price: $19.99
  https://playte.co.uk/product/playte-together/

Applications:

- **Food Explorer Club – For Families with Picky Eaters**
  The Food explorer club app is made for parents to help their children try new foods. They can win badges and rewards by eating certain foods or finishing their plate. There are limited edition badges, which are available for certain periods. Surprise is added by revealing the badges children have earned through tapping on a crate. Children also receive rewards in real-life chosen by their parents. Gamification has been used to encourage children to eat new foods. This app supports the parents at mealtimes.
  https://www.foodexplorerclub.com/

- **When to Wonder: Picky Eating**
  When to Wonder is an application made for parents to understand the eating habits of their children. It is similar to Tinder in a way that children swipe left or right if they like a certain food. Parents then have a better idea of which foods their child likes. The application also gives parents insights and ideas on how to tackle the eating behaviour of their children. The target group of this application is parents with children who are picky eaters, have ARFID or other selective eating habits. This application has been developed by Hassefelds Children's Hospital.
  https://play.google.com/store/apps/details?id=org.nyumc.pickyeater&hl=es_SV

- **Learn Play Eat**
  Learn Play Eat is an app that supports parents to help their children overcome picky eating. It makes use of food play ideas, games and activities to encourage food exposure. The children can earn rewards for interaction with foods and completing food activities. There are sensory activities categorized by the five senses. It has been approved by feeding therapists. This app is also made for children with selective eating habits, ARFID and other food phobias so the target group also has children with ASD in mind. There are daily tips and mealtime hacks included in the application for parents. It supports children aged 3 – 6+. The method used in the application is play-based occupational therapy.
  https://learnplayeat.com/

- **Kids Food Adventure**
  The application focuses on informing children about the health benefits of certain foods. They can earn points by trying new foods and they get to rate them with colours. Children then track their progress by seeing how many new foods they have tried and receive rewards.

Avatars are used to customize the progress of the child. The target group is children 4 and up.
http://www.app-store.es/kids-food-adventure

- **Tiny Tastes**
  Tiny Tastes makes use of a mascot and interactive story to improve the eating habits of children. Parents take a photo of the child's food and it appears in the mascots bowl on the app. The parents can set a timer for how long the meal should last. Children are then encouraged to eat by having a bite to continue the interactive story. Children can earn coins in the app to buy in-game products. This makes use of rewards and progression. The app is made for picky eaters from ages 2 to 6.
  https://apps.apple.com/us/app/tiny-tastes/id926928170#?platform=ipad

- **Autism Food Coach 2**
  The Autism Food Coach 2 is an app made to help slow down people with ASD's eating at mealtimes. It claims to give structure to mealtimes by eating mindfully [41]. A chewing timer is used for each bite of food. It should be mentioned that this application was not made to improve sensory eating, but it still concerns eating behaviour.
  https://play.google.com/store/apps/details?id=com.androidinlondon.autismfoodcoach2&hl=en&gl=US

- **IBloom VR**
  The *IBloomVR* is an application made to work with a VR headset. The Virtual reality environment teaches children with Autism Spectrum Disorder how to deal with certain situations. For example, the child will see the view and hear a park, to get accustomed to a new situation. The VR experience is monitored by a supervisor who can see what the child sees on a second screen in 2D. The goal of this application is to improve behavioural, social, and cognitive skills in children with ASD [42].
  https://play.google.com/store/apps/details?id=com.iBloom.iBloomVR&hl=en&gl=US

- **TalkinPictures**
  TalkinPictures is an application to improve the communications skills of children with ASD. This app also makes use of the Picture Exchange Communication System (PECS). It is made to be a simple to use, educational application with flashcards to help form sentences. Even though this application is not made for eating behaviour it is important to mention because of the way information is portrayed.
  https://play.google.com/store/apps/details?id=com.androidinlondon.autismquicktalk&hl=en&gl=US

Appendix C: Game inspiration

Don't Break the Ice Game

This game is played by hitting a small block of ice every turn from a tray and trying to not let the penguin fall. The player who lets the penguin fall loses. This is a good example of a game where it is about the interaction of the player hitting the ice with a mallet instead of who wins. The game makes use of the element of surprise.

https://shop.hasbro.com/en-us/product/don-t-break-the-ice-game:7DF4542A-5056-9047-F5FA-87295ED41F5C

Tumblin Monkeys Game

After rolling the dice a player must draw a stick from the tree corresponding to the colour on the dice. The goal of the game is to let the least amount of monkeys drop. Surprise is implemented by the chance of monkeys dropping.

https://shop.mattel.com/shop/en-us/ms/mattel-games/tumblin-monkeys-game-t1852

Bunny Hop Game

The player draws a card which either says the player can move one of its pawns forward or they have to turn the carrot in the middle. When the carrot is turned some of the spaces disappear and the bunnies are lost. This game makes use of the surprise of what is under the card as well as the surprise if the players bunny will disappear.

https://www.bol.com/nl/p/ravensburger-bunny-hop-kinderspel/9200000014962455/

Thin Ice Game

A player must place a marble on the tissue every turn. If the tissue breaks when they placed the marble they lose. This game uses the surprise of when the tissue is going to break.

https://www.pressmantoy.com/product/thin-ice/

Dinosaur Escape Game

The dinosaur escape game is a cooperative game, where players must find all the dinosaurs before the volcano is built. It makes use of memory and logic as well as surprise. Since the game is cooperative, the social aspect can be beneficial to children with ASD. Surprise is implemented by the turning over of the memory cards and the rolling of the dice.

https://www.amazon.com/Peaceable-Kingdom-Dinosaur-Winning-Cooperative/dp/B00S288BKI

Dinosaur Dentist Game

Players have to push down a tooth in the dinosaur's mouth. If the ‘aching’ tooth is pressed, the mouth of the dinosaur snaps down. This game makes use of surprise when the mouth snaps shut.

https://www.amazon.com/dp/B07P3H3RXJ/ref=sspa_dk_detail_7?psc=1&pd_rd_i=B07P3H3RXJ&pd_rd_w=jBWFa&pf_rd_p=cbc856ed-1371-4f23-b89d-d3fb30edf66d&pd_rd_wg=cFK8F&pf_rd_r=XQC2DX92EC0Z75FSTNJ1&pd_rd_r=d09f20e0-ee05-4e89-949c-38d941090168&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUEzRkwzTk9JTzNXUUpLJmVuY3J5cHRlZElkPUEwMjAyOTkwM0ZOTUhRUEFCOTlNNyZlbmNyeXB0ZWRBZElkPUEwOTE5ODAxMzRUSzk2OEJLWk1BMyZ3aWRnZXROYW1lPXNwX2RldGFpbF90aGVtYXRpYyZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU=

Food Related Games

- **Piggy GimBap**
  Players must feed the 5 different piggies by collecting 4 different pieces of food to turn the coloured different piggies pink. By rolling the dice players collect a piece of food corresponding to the dice roll. They then place these food chips on a ‘dinner tray’ of one of the piglets. The first player to turn all their piglets' pink wins.
  https://www.buykorea.org/bk/byr/product/GOODS_DETAIL-3084851.do

- **Burping Bobby**
  In this game, players must place a food token in the mouth of a hippo. After a certain amount of food tokens are added to the mouth, the hippo will burp. When the hippo burps the player who added the last food token loses. This game is aged for children 2-4 and up. The idea of adding food to an animals mouth could increase food exposure in children with ASD.
  https://www.amazon.com/dp/B085T59FX4/ref=sspa_dk_detail_2?psc=1&pd_rd_i=B085T59FX4&pd_rd_w=jejcn&pf_rd_p=085568d9-3b13-4ac1-8ae4-24a26c00cb0c&pd_rd_wg=MgALA&pf_rd_r=MD03JF2QPYMNENK9JW0R&pd_rd_r=6be93e09-762d-4707-9514-ee0aa5eda394&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFLN0pFRUM0Q0Q1VDgmZW5jcnlwdGVkSWQ9QTAzMjM1ODMyUFRFWTlVRDBQSzYwJmVuY3J5cHRlZEFkSWQ9QTAyMTMxMTA5RlZWNUE1ME5WN0Umd2lkZ2V0TmFtZT1zcF9kZXRhaWwmYWN0aW9uPWNsaWNrUmVkaXJlY3QmZG9Ob3RMb2dDbGljaz10cnVl

- **Candy Collections**
  Players move around a board and collect candies that are worth points. They can steal candies from other players or trade certain candies. The player with the most points at the end of the game wins.
  https://www.cybelesgames.com/products/candy-collections

Appendix D: Brainstorm list

Interactive board game:

1. An interactive board game where pieces of food light up Teaspoons of food are placed in silicone cups on the playing board and underneath these cups a light shine. The light changes colour when the food is eaten.
   Points: 9, does not have social support
2. Play the sound the food makes when eating it: to prepare children to eat the food, a sound sample of someone eating for example a courgette is played. This can be seen as a small subgoal.
3. Touch the food which is named: a memory game where the child should touch the named food to select the card underneath. The idea is to increase food exposure.
   Points: 7, does not have progress, technology, social support
4. Play music when food is being eaten: When the child eats their favourite music plays to create a positive experience of eating.
5. Play music or light up the board when a pawn is moved: To add interactivity music or light could be used.
6. Pick up a card every time a bite is eaten: the child can look at a picture card to create curiosity for eating the next bite.
7. Play food animation on the phone when a bite is eaten: an animated picture could be played to create surprise.
8. Surprise cards: implement mini-games within the game with surprise cards. These surprise cards could also let the player play their favourite music or change the colour of the board.
9. Plate with colours corresponds to colours on board – eat food from colour
10. Food memory game: food picture cards in memory form. If the child eats a bite, they may turn over two cards on the board.
    Points: 7 does not have interactivity, technology, interactivity
11. Instead of a game board only use movable tiles: coloured spots could be used to make a custom game map every time the user plays.
12. Only move forward when a bite is eaten. this could be in the form of competition to encourage the child to eat.
13. Maze game, board changes every time: Child has to find their way through a food maze to get to the finish.
    Points: 7, does not have progress, interactivity, technology, surprise

14. Ludo game, try and catch the other player by eating bites: Implement competition against other family members.
    Points: 5, interchangeability, progress, technology, interactivity, surprise
15. Press button to play an animation: use technology to increase attention span. The button does unknown things when pressed.
16. A game where coloured sections on a plate correspond to a path around the plate. The child should eat a bite when the pawn is on the coloured circle. If they eat the bite they can pick up a card or play an animation.
    Points: 9, does not have social support
17. Boardgame based around a farm/garden: the theme of the board game.
18. Cardboard plant which is built during the game (like volcano game). The player can add a piece to the plant when they have taken so many bites. For example, if one colour of the food is finished.
    Points: 5, does not have the technology, interactivity, small threshold, choices, surprise
19. Long-term and short-term goals? Within game? This could also refer to building a cardboard plant.
20. One path keeps track of the weekly eating goals, while the other is each mealtime.
21. Theme: Secret garden? Kitchen Chef? Farm? Body Builder?
22. Memory game incorporated in a food game.
23. Spin the wheel to determine the food colour to eat.

Other:

1. Representation of another child eating food: use a deep fake of a sibling eating the food to encourage the child with ASD to eat the food.
   Points: 3 does not have interchangeability, progress, gamification, food exposure, interactivity, choices, surprise
2. Copy the animation: play an animation which the child needs to copy. Similar to Bouaiz et al.
   Points: 5, interchangeability, progress, social support, choices, surprise
3. A Cooking app, which prepares the food with you
   Points: 5 progress, gamification, social support, choices, surprise
4. Place a ball in a tube after every bite so the tube fills up with balls. Different types of board game progress games.
   Points: 4 does not have interchangeability, interactivity, social support, technology, choices, surprise
5. Place food in the mouth of a cardboard cut-out of a child. The idea is to create food exposure by showing how eating works and getting the child to touch the food.
   Points: 3 does not have interchangeability, progress, interactivity, social support, technology, choices, surprise
6. An interactive table that tracks hand moving to pick up food
   Points: 5 does not have interchangeability, progress, food exposure, social support, choices
7. A plate that plays music when food is picked up (weight-sensor)
   Points: 5, does not have interchangeability, small threshold, food exposure, social support, choices
8. Break the ice type of game, place a ball on ice, after every bite. (surprise is when it is going to break)
   Points: 5, does not have interchangeability, progress, food exposure, technology, choices
9. Rabbit hop game with food, where a character can fall through a hole, if they do not move fast enough
   Points: 5, does not have interchangeability, progress, technology, food exposure, interactivity
10. Interactive storybook relating to food → take a bite to turn the page
    Points: 7, does not have interchangeability, gamification, social support
11. Grow a plant by eating bites: a virtual plant grows when food is lifted from the plate or when the button is pressed
    Points: 6, does not have interchangeability, gamification, social support, choices

12. Food trump cards → Food exposure
    Points: 4, does not have progress, interactivity, gamification, food exposure, technology, surprise
13. Make a marble tower, every bite is one marble going down the tower.
    Points: 4 does not have interchangeability, interactivity, social support, technology, choices, surprise
14. An Animated child grows by eating food, every time a bite is eaten, the animated child eats a bite too and grows. Depending on what the child eats, a different part of the body will change.
    Points: 7, does not have interchangeability, gamification, social support,
15. Build cardboard plant after several weeks of completing mealtimes
    Points: 1 does not have interchangeability, interactivity, gamification, small threshold, food exposure, technology, choices, surprise
16. A chart which corresponds to eating → track progress
    Points: 1 does not have interchangeability, interactivity, gamification, small threshold, food exposure, technology, choices, surprise
17. Press the button on a machine and a teaspoon of food pops out, with sounds and music
    Points: 5, does not have interchangeability, progress, social support, choices, interactivity
18. Bunny hop game but when the pawn falls through, the player must eat a bite of food
    Points: 5, does not have interchangeability, progress, technology, food exposure, interactivity
19. A game where food tries to escape in a car and the child must eat the food to keep it safe.
    Points: 4, does not have interchangeability, progress, small threshold, social support, choices, surprise
20. Sounds come from the plate telling the child to eat the food or not (reverse psychology). Food that says stuff like 'I don't want to be eaten' or 'Eat me, eat me' or 'Help you must eat me or I will be stolen'.
    Points: 4, does not have interchangeability, progress, small threshold, social support, choices, surprise
21. Build a line of interactive blocks with food. Each wooden block contains a teaspoon of food. When the food is eaten it can be moved to form a line. Once added to the line sounds or music are played. Once the whole line of food is created the lights and sounds connect.
    Points: 9, does not have social support

Low-Textured foods:

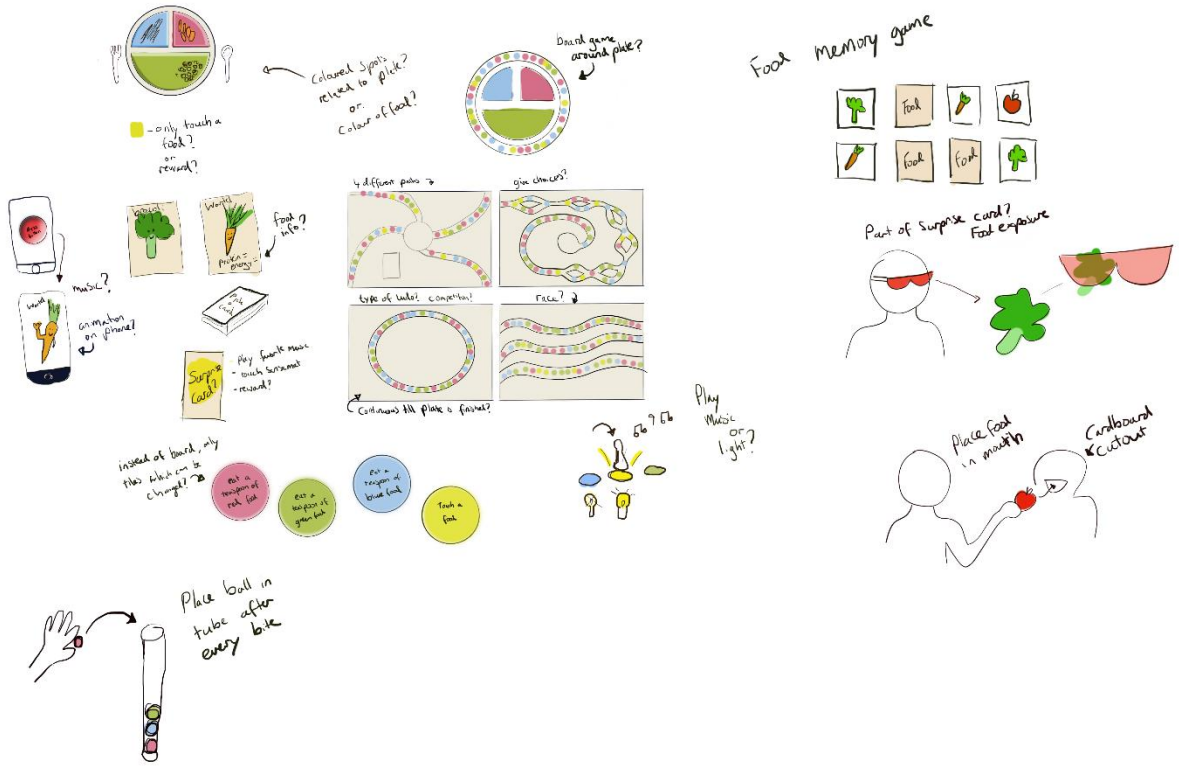
22. Child blends all the food by themselves to increase food exposure. Then eats bites of their blended food.
    Points: 3, does not have interchangeability, progress, gamification, social support, technology, choices, surprises
23. A game where food gradually decreases the amount of blended food. Start with food super blended and while they progress the food becomes less blended.
    Points: 6, does not have interchangeability, social support, choices, surprise
24. Animation of food being prepared and then eaten: to increase food exposure.
    Points: 3 does not have interchangeability, progress, gamification, food exposure, interactivity, choices, surprise

Visual:

25. Look at food through coloured glasses: changing the visual aspects could improve the eating experience.
    Points: 1, does not have interchangeability, progress, interactivity, gamification, small threshold, social support, technology, choices, surprise
26. Blindfold game while eating child is blindfolded while eating.
    Points: 1, does not have interchangeability, progress, interactivity, gamification, small threshold, social support, technology, choices, surprise
27. Pick-up card game to promote curiosity
    Points: 4, does not have progress, interactivity, gamification, social support, technology, choices

28. Augmented Reality changes what food looks like: add faces to AR game
    Points: 4, does not have progress, social support, choices, surprise
29. AR animated hand picks up food
    Points: 5, interchangeability, progress, social support, choices, surprise

Brainstorm sketch:



Appendix E: Interview 1 Client (Dutch)

Coding Scheme:
Curiosity
Development
Play
Autonomy
Touch
Communication
Attention span

Interview Questions:

<u>Nieuwsgierigheid</u>

1. Wat houdt deze kinderen bezig? Wat doen ze op een dag?
2. Wat vinden deze kinderen interessant (om te zien of doen)?
3. Wat vinden deze kinderen van muziek?
4. Wat vinden ze van lichtjes/geluidjes/plaatjes? (ook in verband met prikkel verwerking: overprikkeld/onderprikkeld)

<u>Spel</u>

1. Wat voor soort spellen vinden kinderen met autisme leuk? Spelen ze überhaupt?
2. Hoe zien de fases van spel eruit bij kinderen met autisme? (Spelend manipuleren, spelend combineren, functioneel spel, symbolisch spel, …)
3. Hoe spelen kinderen met autisme in verband met competitie tegen anderen? Houden ze van competitie? Zoals bij spellen als ‘Mens erger je niet’? Of spellen waarbij je zo snel mogelijk bij een einddoel moet komen?

4. Vinden kinderen met autisme het moeilijk om keuzes te maken in spellen?

(Sociale) interactie en communicatie

1. Hoe communiceren deze kinderen met hun ouders?
2. Hoe communiceren de ouders met hun kinderen?
3. Wat werkt goed qua communicatie tussen ouder en kind?
4. Wat werkt niet goed qua communicatie tussen ouder en kind?

Spanningsboog

1. Hoe lang kan een kind zijn/haar aandacht bij het avondeten houden? (zonder extra hulpmiddelen)
2. Hoe lang kan een kind zijn/haar aandacht bij iets houden wat hem/haar interesseert?
3. Wat zou een ideale spanningsboog zijn voor het avondeten? Hoe lang zou een kind zijn/haar aandacht bij het avondeten moeten houden?

Motoriek

1. Hoe is de motoriek van de kinderen? (bal gooien, iets omdraaien, stapelen, etc.)
2. In hoeverre is het leuk voor een kind als de ouder een grote rol heeft in het ´spelen' van een spel? Stel dat er aan een knopje moet worden gedraaid door de ouder (omdat het kind dit nog niet kan), wat zou het kind hier dan van vinden?

Ontwikkelingsniveau

1. Kunnen deze kinderen tellen?
2. Kunnen de kinderen vormen herkennen en onderscheiden?
3. Kunnen ze kleuren herkennen en onderscheiden?

Interview:

"Ten eerste wil ik zeggen dat ik het heel erg lastig vind om een soort van algemeen iets te zeggen over deze kinderen. Eigenlijk kijken we ook nooit zo, we kijken natuurlijk naar het kind zelf, wat doet die. Ik vind ook dat kinderen op deze leeftijd nog zo veel kunnen verschillen, dus ik doe het meer vanuit wat ik zie in de praktijk dan vanuit de theorie. Ik denk dat dat beter is en dat dat misschien net iets beter aansluit bij jullie onderzoek. We zijn waarschijnlijk niet helemaal synchroon met de theorie, maar goed, dat is een beetje het verhaal."

"Op internet zijn echt genoeg dingen te vinden over de normale ontwikkeling qua spel, dus die kan je echt wel ergens vandaan plukken. Misschien zelfs op ouders van nu, dat soort sites. Daar is genoeg over te vinden."

Nieuwsgierigheid

"Deze kinderen zijn nog wel heel erg afhankelijk van hun omgeving, dus van hun ouders, ook wat zij dus doen op een dag. De meeste kinderen gaan wel vaak op pad om te ontdekken, eigenlijk misschien nog wel meer dan gemiddeld. Het is zo, je gaat op pad en je komt iets tegen en je gaat weer terug naar de oude. En ik vind dat de IMH tools – moet je daar maar eens naar kijken – daar staat een stukje over hechting in en er staat eigenlijk in dat je als kind op onderzoek uitgaat. Dat heet de cirkels van vaardigheid. Ik denk dat de kinderen die wij regelmatig zijn, die zijn onveilig gehecht, die gaan soms te veel op pad. We zien soms dat kinderen heel nieuwsgierig zijn, en dan niet hun vader of moeder daar in betrekken, of te weinig erin te betrekken, laat ik het zo zeggen. Dus ja, dat houdt ze bezig, dat vinden ze interessant. Ik denk dat muziek en taal, dat dat soms al heel erg tot de verbeelding speelt, spreekt, en dat het wel een belangrijk stukje is voor de ontwikkeling. Door muziek zie je gewoon de taalontwikkeling vooruit gaat, we zien ook best veel kinderen die moeite hebben met taal, en die achterlopen in de ontwikkeling, en die bijvoorbeeld moeite hebben om hun emoties onder woorden te brengen. Dus muziek is daarin een belangrijke factor om die taalontwikkeling meer op gang te brengen. En dat is ook iets wat kinderen, sowieso tot 6 jaar echt wel heel erg leuk vinden om te doen, ze zijn daar nieuwsgierig naar. Lichtjes en geluidjes, en plaatjes, dat is heel erg passend in de ontwikkeling in deze kinderen. Qua prikkel verwerking: Als je kinderen hebt met autisme, die zijn soms ondergestimuleerd, of juist overgestimuleerd, en dat in tentatie (? Minuut 6:20) van eten kijken wij daar wel heel veel naar, dan brengen we een sensorisch profiel in kaart, van hoe ziet de zintuigelijke waarneming eruit. Qua tenatie(? Minuut 6:37) van het eetstuk ligt de overprikkeling of onderprikkeling meer in het mondgebied zelf. En ik vind het nog minder qua zien. Dat is toch misschien nog niet genoeg ontwikkeld dat je daar goed iets van kan zeggen. Bijvoorbeeld, wanneer de hele kamer vol staat met speelgoed, dan zie je bij sommige kinderen dat ze niet tot spelen kunnen komen, dat zien wij wel. Wij kijken altijd hoe de kamers eruit zien, dat daar niet te veel spulletjes staan. Maar als je gericht een soort speelgoed aanbied, dan mag daar best wat drukte zijn. Persoonlijk houdt ik zelf bijvoorbeeld wel van een lijnenspel, het plaatje moet vooral duidelijk zijn. We

werken best wel veel met zwart-wit pictos, zodat het gewoon heel duidelijk is wat de bedoeling is. Maar ten aanzien van speelgoed, verschild dat niet heel veel met de normale ontwikkeling, daar kun je ook best wat drukkere dingen gebruiken. Ik vind bijvoorbeeld niet dat muziek te druk is of dat ze daar overprikkeld door raken. Het is vooral dat kinderen met angsten of autisme moeilijk tot spel komen. Als je dus een afgebakend spel hebt, waarin de volgorde heel duidelijk is, dan komen zij tot spelen. Wij zien ook in de hele ontwikkeling dat kinderen moeite hebben met het tot spelen komen, en ook – dat is meer met kinderen van 4 tot 6 jaar – dat een plan om te spelen ontbreekt. Met spel heb je een soort van plan in je hoofd nodig, van wat ga je doen (poppetjes neerzetten of playmobiel, blokjes neerzetten), om tot spelen te komen, en dat ontbreekt vaak. Omdat kinderen met autisme die samenhang niet hebben, waardoor ze moeilijker tot spel kunnen komen, daar hebben ze de volwassenen wel bij nodig. Kinderen met autisme vinden die computer spelletjes bijvoorbeeld heel prettig, want daar zit een duidelijke structuur in. Dat is fijn, want dan hoef je daar zelf niet zo bij na te denken."
"Imiteren is inderdaad iets wat ze doen. Wij leren door dingen die voor worden gedaan na te doen, dus imitatie, en dat toe te passen in andere situaties. Dat vindt onze doelgroep erg moeilijk. Ook het imiteren kan soms al heel lastig zijn. Het duurt langer voordat patronen zijn ingeslepen. En wat wij ook zien is dat kinderen de hele dag hetzelfde doen, zoals autootjes op een rijtje zetten. Dat is fijn, het is prettig om de hele tijd dezelfde handeling te doen. Er moet ook een bepaalde interesse zijn. Ze zijn veel geïnteresseerd in treinen en auto's. Beweging vinden ze wel leuk, dat er beweging in zit."
"Qua tast zien we vaak een onder- of overprikkeling. Kinderen hebben vaak moeite met zand, water, modder, onze doelgroep vindt dat vies, die willen dat niet, in tegenstelling tot normale kinderen die dat juist leuk vinden. Daar proberen we ze wel in te stimuleren, door scheerschuim of zakjes met afwasmiddel, je hebt ook van dat zand (kinetisch waarschijnlijk). Maar de tast is wel een belangrijke, ze houden qua speelgoed wat meer van harde stukken. Ze kunnen uren kijken naar windmolentjes bijvoorbeeld, dat helpt hun om rust te krijgen, maar het helpt hun niet verder in hun ontwikkeling. Om hun verder te brengen in hun ontwikkeling moet je hun nieuwsgierigheid opwekken, je moet altijd wat achter laten zodat zij benieuwd zijn naar wat er nog komt, naar een volgend level bijvoorbeeld. Daarin speelt de kracht van herhaling dus wel een rol. Bijvoorbeeld, de Teletubies, de kracht van die filmpjes zit 'm in de herhaling, het is altijd op dezelfde manier opgebouwd, maar elk filmpje is net anders."

Spel
"Die fases van spel, die hebben jullie ook al mooi omschreven, goed uitgezocht. Heel veel kinderen zitten in functioneel spel, echt symbolisch spel. Het fantasie spel, dat je echt met poppen kan spelen en kan bedenken dat de pop ziek is, en dat papa of mama voor de pop gaat zorgen, dat is veel minder aanwezig. Dan is het meer iets wat zij hebben gezien of mee hebben gemaakt, en dat wordt dan nagespeeld. Dan komt het niet uit hun eigen fantasie."
"Officieel is het zo dat competitie er minder in zit, maar ik zie het toch wel binnen de praktijk. Van de week was er een jongetje van 3.5 en zijn broertje zei tegen hem van we doen een wedstrijdje wie er het eerst het eten op heeft. Daar ging ie wel in mee. En ik denk dat die jongen autisme heeft, en eetproblematiek heeft hij ook. Dus daar zie ik soms wel competitie achtige dingen in, maar dat is dan niet gericht op de relatie tussen mensen maar meer op het willen winnen. En in spelletjes zoals mens erger je niet, dat is ook echt wel van mens erger je wel, omdat er veel onverwachte dingen in het spel gebeuren. Dat soort spelletjes gebruik ik vaak omdat ik weet dat er een conflict gaat ontstaan. En dan ga ik kijken wat de kinderen en ouder ermee doen. Eigenlijk al dat soort spelletjes vinden ze wel heel erg leuk, maar bij veel spellen zitten te veel onverwachte dingen, daar heb je geen controle over, als je een zes gooit dan heb je geluk. Autonomie is ook erg belangrijk, dat zij het gevoel hebben dat ze zelf de leiding hebben. Ik gebruik ook heel vaak wel dingen zoals dat kinderen bijvoorbeeld tijdens het eten mogen kiezen uit twee, dan is de ouder degene die bepaald, maar dan mag het kind dat kleine deel bepalen, dat zij dat gevoel van autonomie ook hebben en zo ervaren. Dat is denk ik wel een heel belangrijk stuk binnen onze doelgroep, om ze tot iets te brengen."

"Sommige kinderen, al helemaal van 2 tot 4, kunnen nog niet echt keuzes maken, dan moet je de keuzes voor hun maken. Zodra de keuze groter wordt, van kies maar uit tussen hagelslag, jam of pindakaas, dan wordt het te ingewikkeld, dan kunnen ze juist niet kiezen omdat alles (niet) lekker is. De keuze moet je beperkt houden, ook afhankelijk van het kind. Bijvoorbeeld een detail van mens erger je niet, dat je een kleur pionnetje kiest, en die dan neer gaat zitten op het bord, dat kan soms al heel ingewikkeld zijn en ook tot conflicten leidden. Uiteindelijk komt het er op neer dat iemand anders gaat kiezen, en dan heb je strijd omdat iemand anders kiest. Ik denk dat voor wat jullie gaan ontwikkelen, dat de kinderen zelf een keuze maken en dat ze niet te veel hebben om uit te kiezen, en dat die autonomie dus wel heel erg belangrijk is. Dat je met nieuwsgierigheid en regelmaat en

duidelijkheid iets maakt, dat zijn wel belangrijke dingen. Heel veel gezelschapsspelletjes vinden ze echt heel leuk om te doen. Eigenlijk vinden ze alle gezelschapspelletjes wel leuk, voor 2 tot 4 jaar kun je wel memory doen, en dan kun je dat afhankelijk van het kind heel simpel kan maken, of dat het kind ergens een plaatje op moet leggen (jij hebt een plaatje van een koe, leg die maar op de koe), die taakgerichtheid kun je best wel intrainen. Onze doelgroep kan heel wat aan, als het spel maar duidelijk neer wordt gezet, dan kunnen de kinderen er best wat mee. Van allerlei spelletjes vinden ze leuk, voor de doelgroep van 2 tot 6. In Hengelo heb je een hele mooie spellen winkel, de dondersteen, die hebben ook een website. En de eigenaar, ik denk dat die autisme heeft, die heeft heel veel verstand van spelletjes. Mocht je denken, goh ik wil toch graag nog wat meer informatie, misschien is hij wel geschikt. Hij is heel enthousiast, wij hebben daar wel spelletjes gekocht een tijd geleden, maar hij heeft veel verstand van spelletjes en hij legt ook van alles uit. Wie weet heb je daar nog wat aan."

(Sociale) interactie en communicatie
"De communicatie, daar is vaak wel een achterstand in. Bijvoorbeeld, dat ene jongetje van drie, die zegt niet wat hij denkt, die gilt, en ja die stort zich neer op de grond. En dan moeten de ouders maar raden wat er aan de hand is. Dus hij gebruikt taal niet echt. Als ik met jullie praat, dan weet ik dat ik verder kom. De functie van taal, bij deze doelgroep, is te weinig aanwezig. Het is veel eenrichtingsverkeer, ik vertel jou wat je moet doen. Het gaat te weinig over en weer. Het is soms lastig om een kind uit te leggen hoe een spel werkt en om dan te checken of het kind begrijpt wat je hem/haar vertelt. Al doende leer je, door meer ervaring op te doen. Vaak ga ik hier ook met ouders mee in gesprek, van jij zegt nu dit, denk jij dat dit overkomt, daar gebruik ik dan ook video voor. Heel veel kinderen kunnen wel luisteren, maar het daadwerkelijk verwerken van de informatie is een tweede, dat is echt wel lastig, waardoor taal niet altijd goed binnenkomt. En dat is denk ik ook een groot probleem, als je aan tafel zit met z'n allen, dan moet je eten, daarnaast staat er nog allemaal spul op tafel, en daarnaast zitten er nog ander mensen aan tafel die ook allemaal iets zeggen. En heel ingewikkeld proces. Ik ga altijd wel met ouders kijken, wat is het concept eten? Wat is het eten voor jullie, wat vinden jullie belangrijk hierin? En soms betekent dat ook dat alle pannen van tafel gaan en dat ik gebruik maak van een placemat is waarop precies staat wat we gaan doen. En dan wordt er bijvoorbeeld ook niet gesproken aan tafel. Omdat het kind eerst moet leren eten, voordat hij ook gezellig iets kan vertellen aan tafel."

(Aan de hand van Sophie haar verhaaltje over dat het kind moet eten uit een bootje: dan linkt het kind het eten aan, wat het des te moeilijker maakt om dan weer terug te gaan naar het eten uit een bord)
"De patronen worden snel ingeslepen, bijvoorbeeld dat een kind altijd uit de blauwe beker wil drinken. Ik heb nu een kindje, die eet alleen een banaan of appel in de supermarkt. En dat komt doordat bij de Lidl kon je een stukje appel or banaan pakken, wat hij daar dus heeft geleerd, en hij kan dat dus niet toepassen in andere situaties. Dus dat is wel iets waar je rekening mee moet houden. Het concept eten moet wel bestaan blijven, dat het bestaansrecht heeft."

(Naar aanleiding van Elsi haar vraag: En wat betreft een bord met verschillende vakjes met verschillende kleuren (groen, blauw, rood)? Zouden sommige kinderen dan niet van een bepaald soort kleur bord willen eten? Zouden ze dat vervelend vinden?)
"Nou, nee. Wij gebruiken nog best wel vaak op latere leeftijd nog een drievaksbord. Dan raakt het eten elkaar niet uit, dus de aardappels bij de aardappels en de groente bij de groenten. Dan is rijst of pasta, dat zit allemaal te veel door elkaar, dat zijn echt de moeilijke maaltijden."

(Sophie: In hoeverre moet het eten warm blijven?)
"Soms komen wij erachter dat kinderen het eten niet willen eten omdat het te warm is. Zij eten liever warm eten koud, dat het afgekoeld is."

Spanningsboog
"De aandacht bij het eten houden is heel ingewikkeld, omdat zij het concept "eten" niet zo goed kennen, en die taakgerichtheid moet van buitenaf komen. En dat betekent dus dat je als ouder je kind bovengemiddeld aan moet sturen, van dit is de bedoeling. En ouders denken in dit stuk van de ontwikkeling nog dat het wel vanzelf komt, dat is ook wat ze meekrijgen vanuit het consultatie bureau (hij gaat vanzelf wel eten). Dus wat er gebeurt is dat ouders dan een soort afwachtende houding hebben, dat ze onduidelijk zijn naar het kind, en dat de eetproblematiek versterkt wordt, waardoor ze steeds minder gaan eten. Hoe eerder je er dus bij bent, hoe makkelijker je het op kan lossen. Wanneer ze bij ons in de praktijk binnen komen, dan is het al heel erg slecht geworden, ouders zijn

dan wanhopig. Deze week hadden we ook huilende moeders aan de telefoon. Het eten komt ook elke dag terug, meerdere keren op een dag. Of ze gaan dan heel erg de strijd aan met een kind, of ze laten het en ze zien dan dat het kind steeds minder gaat eten. Dus ouders voelen zich echt heel onmachtig, zij worden ook niet begrepen door de buitenwereld. Want die hebben zo iets van, nou breng het kind maar een weekje hier en dan eet hij wel. Dus ik vind dat eenzame problematiek, als ouder sta je er alleen voor."

"De aandacht spanning is een kwartiertje, misschien een half uurtje, dan is het ook echt wel afgelopen. En wat ik ook merk is dat de kinderen overdag al zo veel prikkels hebben gehad, dat zij eigenlijk bij het avondeten te moe zijn om die taak te volbrengen. Soms halen wij dan ook het avondeten naar het middageten toe, omdat ze dan wat meer fris en fruitig zijn. (Na Sophie haar vraag over hoe we ons concept daar op aan zouden moeten passen) Ik denk dat je iets moet maken dat wel bij de lunch zou kunnen zijn. Soms gaan we ook eerder eten, bijvoorbeeld om 4 uur, dan is het dus wel avondeten, maar dan eten we even apart met ze, maar dan uiteindelijk is het wel de bedoeling dat je met z'n allen aan tafel gaat eten, maar dat het eet train stuk of het spelletje voor het eten kan. En tijdens de lunch kan zowel warm eten als boterhammen worden gegeten."

Motoriek
"Het motorische stuk vind ik heel ingewikkeld. Dat is heel verschillend. We zien wel vaak een motorische achterstand. Ook bijvoorbeeld met de lepel naar de mond brengen. Daar gaat ook veel energie in kwijt, als dat op een gegeven moment niet zo goed gaat dan is het ook klaar, waardoor je ook minder gaat eten dan gemiddeld. Maar goed, veel verschillen per kind. Als kinderen gevoerd moeten worden door de ouder, dan valt misschien een stukje autonomie weg, maar het kind kan ook gewoon z'n mond dicht houden, dat is ook een stukje autonomie dat het kind wel houdt."

Ontwikkelingsniveau
"Kunnen kinderen tellen? Ja, tellen vinden ze vaak wel leuk. Vormen herkennen en onderscheiden is ook wel prima. Juist het onderscheiden en herkennen is denk ik een sterke kant, omdat het in de details zit. Detailwaarneming is groter dan het algehele concept waarnemen."

Appendix F: Code Application

Java Processing Code

Tab 1

```
/*Code for Application Bachelor Thesis Creative Technology - Dinner
Time
By Elsi Muller
Supervisor: Randy Klaassen
Critical Observer: Juliet Haarman
Prototype app with a button which when pressed shows a random
animation*/
import processing.video.*;

String[] movieNames= {"Courgette-1.m4v","Paprika-1.m4v","Tomato-
1.m4v","Wortel-1.m4v"}; //file names
Movie[] movies = new Movie[movieNames.length];
PImage backImg; //background image
PFont buttonText; //font for buttontext

PressButton pressbutton;
boolean videoPlay;

void setup() {
  size(540, 810); //size of screen
  pressbutton = new PressButton();
  backImg = loadImage("appBackground.png");
  buttonText = createFont("BebasNeue-Regular.otf", 36);
```

```
  backImg.resize(540,810);
  for (int i =0; i<movieNames.length; i++){ //initiate where videos are
stored.
    movies[i] = new Movie(this, movieNames[i]);
  }

}

void draw() {
  pressbutton.drawButton();
  pressbutton.press();
  pressbutton.drawFrame();

  if (!videoPlay) {
    pressbutton.drawButton(); //if the video is not playing show button
and background
  }
}
void movieEvent(Movie m) { //read the video files
  m.read();
}
```

Tab 2

```
class PressButton {
  float buttonX, buttonY, buttonRadius, XsizeButton, YsizeButton;
  boolean buttonPressed;
  int videonum;

  PressButton() { //initiate values
    buttonX = width/2;
    buttonY = height/2;
    buttonRadius =200;
    buttonPressed = false;
    videonum = 0;
  }

  void drawButton() { //Startscreen
    background(backImg);
    fill(#B33951);
    ellipse(buttonX, buttonY, buttonRadius, buttonRadius);
    fill(#000000);
    textAlign(CENTER, CENTER);
    textFont(buttonText);
    text("Ik heb gegeten", buttonX, buttonY);
  }

  void press() {
    float distance= dist(buttonX, buttonY, mouseX, mouseY); //distance
between mouse and button
    buttonRadius = constrain(200, 200, 500); //button does not grow
over the whole screen

    if (distance<(buttonRadius) && !videoPlay) { //when mouse overlaps
button, button grows
      buttonRadius+=10;
      if (mousePressed) { //When mouse is pressed video plays
        println("true");
        videoPlay = true;
```

```
        videonum = int(random(0, movieNames.length));
        println("playing video".concat(Integer.toString(videonum)));

        movies[videonum].play();
      }
    }

    if (movies[videonum].time() > 7.033 ) { //if the video is finished,
stop the video
      println("stopping video".concat(Integer.toString(videonum)));
      movies[videonum].stop();
      videoPlay = false;
    }
  }

  void drawFrame() {
    image(movies[videonum], 0, 0, width, height); //show where movie is
  }
}
```

Processing/P5JS Code

```
/* Code for Application Bachelor Thesis Creative Technology - Dinner
Time
By Elsi Muller
Supervisor: Randy Klaasen
Critical Observer: Juliet Haarman
Prototype app with a button which when pressed shows a random animation
Made for web server*/
let movieNames= ["Courgette-1.m4v", "Paprika-1.m4v", "Tomato-1.m4v",
"Wortel-1.m4v"];
let backImg;
let font;

let videoPlay = false;

let buttonX, buttonY, buttonRadius, XsizeButton, YsizeButton;
let buttonPressed; //boolean if button pressed
let videonum; //Number which decides the video

let distance; //distance mouse to button

let videos = []; //string of videos

function setup() {
  createCanvas(displayWidth, displayHeight);
  backImg = loadImage('appBackground.jpg');

  movieNames.forEach((movie) => { //
    video = createVideo(movie);
    video.hide();
    videos.push(video);
  });

  console.log(videos);

  font = loadFont('BebasNeue-Regular.otf');

  buttonX = width/2;
```

```
  buttonY = height/2;
  buttonRadius = 200;
  buttonPressed = false;
  videonum = 0;
}

function draw() {
  if (!videoPlay) { //if the video is not playing show the startscreen
    drawButton();
  } else {

    image(videos[videoNum], 0, 0, width, height); //otherwise show the
video

  }
}

function drawButton() { //setup startscreen
  background(backImg);
  fill('#B33951');
  ellipse(buttonX, buttonY, buttonRadius, buttonRadius);
  fill('#000000');
  textAlign(CENTER, CENTER);
  textFont(font);
  textSize(36);
  text("Ik heb gegeten", buttonX, buttonY);
}


function mouseClicked() { //if mouse is clicked assign random number and
play video
  distance = dist(buttonX, buttonY, pmouseX, pmouseY);
  if (!videoPlay && distance<buttonRadius/2) {  //if the video is not
playing and the button is clicked
    console.log(mouseX);
    console.log(mouseY);
    videoNum = Math.floor(Math.random() * 4); //assign random number
    console.log(`playing video ${videoNum}`);
    videoPlay = true;
    videos[videoNum].play(); //play the video from the assigned number
    videos[videoNum].onended(stopVideo); //when the video finishes
playing, stop the video
  }
}

function stopVideo(video) {
  console.log(`stopping video ${videoNum}`); //stop playing video
  video.hide();
  videoPlay = false;
}
```

Index

```
<html>
<head>
  <meta charset="utf-8">
```

```
  <meta name="viewport" content="width=device-width, initial-
scale=1.0">

  <script language="javascript" type="text/javascript"
src="libraries/p5.min.js"></script>
  <script language="javascript" type="text/javascript"
src="vegetable_activation_js.js"></script>

  <style> body { padding: 0; margin: 0; } </style>
</head>

<body>
</body>
</html>
```

Appendix G: Interview Structure (Dutch)

Voordat we beginnen zou ik u willen bedanken voor uw tijd. Dit interview gaat om het ontvangen van feedback om het product te verbeteren. Dus alles wat jullie delen is gewenst. Jullie worden niet getest. Je helpt mij juist door kritiek te geven. Ik zal beginnen met het idee uit te leggen en dan wat vragen te stellen.

Het idee:

Het spel bestaat uit drie onderdelen: het bordspel, het bord en animaties. Op het bordspel zijn gekleurde vakjes en deze vakje corresponderen met de gekleurde vakjes op het bord. De vakjes op het bord kunnen uitgewisseld worden voor vier vakjes in plaats van drie, als er meer dan drie soorten eten op die avond gekookt wordt. Het kind begint hier (paarse vakje) boven aan en gooit de dobbelsteen. Als de speler land op bijvoorbeeld blauw, dan moet hij/zij een theelepel eten van het blauwe stuk van het bord. Als dat lukt, mogen ze op het knop drukken op de app, dan wordt er een korte animatie afgespeeld, dat als motivatie zou moeten dienen om het hap eten te nemen. Het kind mag dan weer het dobbelsteen gooien om op een nieuw vakje te landen. Er zijn drie speciale vakjes op het bord. Het paarse vak met dobbelsteen, laat de speler nog een keer gooien. Het handje aan het eind van ieder rondje, laat het kind een hap eten weggeven. Dit vakje wordt iedere keer geactiveerd als een rondje voltooid is. Op het gele vakje mag het kind kiezen welke eten ze eten, of wordt het ingewisseld voor het gele vakje op het bord.

1. Heb je vragen over hoe het werkt?
2. Is er iets wat je verwart? En zo ja wat?

Het prototype laten zien. Opdrachten geven:

1. Hoe zou je het spel starten?
2. Wat is het volgende wat je zou doen?
3. Hoe zou je dit spel uitleggen aan uw kind?

Wat extra vragen:

1. Hoe denkt u dat dit idee kan bijdragen aan het eetgedrag van uw kind?
2. Hoe zou u dit spel kunnen inzetten om de specifieke eet gerelateerde problemen van u kind te helpen?
3. Wat vind je leuk aan dit idee?

4. Wat zou je toevoegen?
5. Wat zou je veranderen?
6. Hoe denk je dat jouw kind dit spel zou vinden?
7. Zou jouw kind dit spel saai vinden na een aantal keer gebruikt te hebben? En dan hoezo?
8. Wat is de moeilijkheidsgraad van dit spel voor jouw kind na jouw mening? Te moeilijk? Te makkelijk?
9. Hoe zou zo een soort spel binnen jullie gezinssituatie/eetsetting passen?
10. Wat voor methodes heeft u eerder geprobeerd om het eetgedrag van uw kind te helpen?
11. Is dit spel vergelijkbaar met iets wat u eerder geprobeerd heeft? Zo ja, hoe?

Het bord wordt weer laten zien.

Plate

1. Wat vind je van het bord?
2. Hoe voegt dit toe aan het spel?
3. Wat zou je veranderen aan het bord?

De animaties van het spel worden laten zien als voorbeeld, samen met de app concept.

Animation/phone

1. Wat vindt u van de animaties?
2. Welke andere animatie onderwerp zou u willen zien?
3. Wat zou u veranderen aan de animaties?
4. Wat vindt u van het gebruik van een telefoon in het spel?
5. Zijn de animaties op het denkniveau van uw kind?

Het bordspel lay-out wordt getoond.

Boardgame

1. Wat vindt u van de bordspel lay-out?
2. Zou je iets veranderen aan het bordspel lay-out?

Einde

12. Ziet u zichzelf dit spel gebruiken?
13. Wat voor cijfer zou je dit idee geven?
14. Heb je nog vragen?

Appendix H: Consent form and Information Brochure

Information Brochure:

Dear reader, in this letter, we would like to inform you about the research you have applied to participate in. The experiment will take place on ____, in person (location still to be decided).

To partake in the experiment you need to meet the following requirements.

- You have experience working with and/or knowledge of children with Autism Spectrum Disorder.
- You are a healthy adult with an age of 18+.

Background

Children with Autism Spectrum Disorder (ASD) often have difficulty eating food. This concerns rigid eating

habits, resistance to try new foods, sensory abnormalities, or appetite inhibition (Turner et al., 2020). This causes countless problems for the children as well as the parents and guardians.

Many methods have been created and tested to improve the eating behaviour of children with ASD. At present, there are limited solutions implementing gamification, playification, toyification and technology in helping these children. There are also very limited approaches to helping guardians or parents implement the methods and training programs to support them.

The goal of this thesis is to evaluate the potential for technological adjustments to known training methods regarding the eating behaviour of children with ASD. The main research question is: How can gamification, playification, or/and technology be used to change the eating behaviour of high-functioning children with Autism Spectrum Disorder?

Procedure
We will ask you to participate in answering some questions concerning children with ASD and help with the co-creation of ideas to improve the eating behaviour of children with ASD. You may be shown images, prototypes and concepts concerning the eating behaviour of children with ASD. The research will be in the form of a semi-structured interview and the researcher may ask follow-up questions.

For analysis purposes, the experiment will be audio recorded. This recording will not be shared with the researcher and the recording will be erased after. Recording the interview is of importance, so that collected information can be properly analyzed and used in the research.

Duration
30-60 minutes

Anonymity
During the interview, personal information will not be collected that can identify you. Information about the research will not be shared beyond the researcher. In research reports, you will remain anonymous. Any participant data will not be disclosed to third parties without your permission.

Voluntary participation
All participation in this research is voluntary. You may refuse to continue at any time (up to 24 hours afterwards). The collected data will then not be used in this research.

If you have any objections or questions, do not hesitate to mention them.

Contact information researcher:
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Witbreuksweg 387E-001 7522 ZA

Contact information Supervisor
Randy Klaasen (r.klaassen@utwente.nl)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant or wish to obtain information, or for other questions and also for complaints about this research, please contact the secretary of the Ethics Committee of the Electrical Engineering, Mathematics and Computer Science at the University of Twente, P.O. Box 217, 7500 AE Enschede (NL), email: ethicscommittee-cis@utwente.nl).

Consent Form for Dinner Time - Bachelor Thesis Creative Technology (interview)

YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

A bachelor thesis to design a product to change the eating behaviour of children with Autism Spectrum Disorder and thereby support the parents.

Please tick the appropriate boxes	**Yes**	**No**
Taking part in the study		
I have read and understood the study information dated _____, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	□	□
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	□	□
I understand that taking part in the study involves answering questions honestly.	□	□
Use of the information in the study		
I understand that information I provide will be used for research prior to developing a product to change the eating behaviour of children with ASD.	□	□
I agree to be audio recorded.	□	□

Signatures

_____	_____	_____
Name of participant	Signature	Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____	_____	_____
Researcher name	Signature	Date

Study contact details for further information:

Elsi Muller, (e.a.muller@student.utwente.nl)

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, or for other questions and also for complaints about this research, please contact the secretary of the Ethics Committee of the Electrical Engineering, Mathematics and Computer Science at the University of Twente, P.O. Box 217, 7500 AE Enschede (NL), email: ethicscommittee-cis@utwente.nl).

Appendix I: Interview Transcriptions

Coding Scheme

Social interaction
Plate
Animation
Board layout
Game mechanics
General consensus
Participant information
Motivation to eat

Interview 1:

Ik zocht inderdaad een start om te beginnen die heel herkenbaar zou moeten zijn (improve the start position). Moves the pawn. Understands going round the plate.
Maar dan in de app heb je niet van bepaalde kleuren of zo? Dat filmpje is daarom altijd wel herkenbaar? *ja.* Nou dat is wel altijd belangrijk voor kinderen met autisme.
De animaties zijn allemaal groente? *ja.*

Vind je het duidelijk de animaties voor kinderen?
Ja het bordspel opzicht lijkt me heel duidelijk, het is inderdaad leuk dat er een filmpje aan zit kwa beloning, want dat maakt het wel inderdaad voor de motivatie die je nodig hebt. Maar wat ik bij hem (het kind) dus zie, dit soort dingen kent hij al. Je zou dus ook iets meer bij kunnen doen, iets met geluidjes, of een feestje of bepaalde blokjes die in elkaar vallen. Want je relateerd het nu weer terug naar het eten. Dus dan komt het kind weer iedere keer oh ja nu komt het weer met het eten. Maar als er nog iets anders aan vast zit, dus bijvoorbeeld een feestje. Een paar ballonen die de lucht in gaan. Of dat je ballonnen met 1, 2,3 dat het op die manier educatief is. Of bijvoorbeeld dat dit is het kleur blauw met een ster. Dat vinden ze ook leuk maar dan ben je niet gefixeerd op het eten. Het eten opzicht is al heel beladen, dus als je dan ook gaat laten zien van oh dit is een wortel. Dat is op een andere moment fantastisch, maar tijdens het eten is dat te veel. Vooral als ik naar mijn eigen kind kijkt, dan is dat bij autistische kinderen nog erger. Want die voelen heel snel heel veel druk, heb ik toevallig wel ervaring mee. Ja elke kind is wel anders. Dus als je er echt op door zou willen gaan, voor jongens en voor meiden apart. Sommige jongens vinden dinos heel stoer, dus iets over de oudheid. of voor meisjes die vinden dan andere dingen heel leuk, hoeveel kralen zitten er aan een ketting. Een kinderbrein zoals ik het ervaar met die twee (de kinderen) is gewoon heel bijzonder. Dat kan alle kanten op. En dan daarnaast ondanks dat dit heel leuk is. Mis je wel de interactie tussen papa en mama tijdens het eten. Misschien dat je daar dan wel wat mee kan. Want het ouder is voor het kind de enigste stabiele factor. Veel vaders en moeders werken de hele dag, dus als je dan thuiskomt van het werk en het is het eten en je komt dan met een spelletje aan het doen. Heel fijn dat hij eet, maar je hebt niet de interactie want vaak is het eten, eventjes zitten eventjes een boekje lezen en naar bed, als ze heel jong zijn. Als ze wat ouder zijn dan is het ook even televisie kijken. Maar met zo een spel heb je niet even het familie event. Dat familie moment is dan weg. Dus als je het uit zou breiden dan zou je het ook met zijn allen kunnen spelen. Dus ook met papa en mama erbij. Dat ze met meerder spelers spelen. Of dat ze inderdaad allemaal zo een bordje hebt. Dan maak je het eigenlijk een groepsactiviteit, dan heb je ook al meer interactie met elkaar. Dan maak je het leuk, want als ik dit alleen zou moeten spelen, terwijl een ander gewoon zijn eten zit op te eten, dan heb ik heel snel zoiets van hmm ja oké. Dus als iedereen wel zijn eigen dobbelsteen en zijn eigen pionnetje heeft dan hoef je niet te wachten op elkaar. Maar dan laat je wel zien dat iedereen anticipeert in het feit dat je probeert te bereiken. En dat je juist dan wel een heel goed hulpmiddel daarbij hebt.

bij je eigen kind?
Ik zou inderdaad meerdere uitvoeringen van willen hebben, zodat we het samen kunnen doen, zonder het filmpje. Zodat hij dan ziet dat we het allemaal doen. En het is een spelletje dus dat vindt hij leuk. Dus als hij een hap opgegeten heeft dat ze dan gaan Yessen. Dus dat is voor hem het ultimate goal zeg maar. Als je dan ook wat meer momenten hebt in het bord waarbij je dus mag juichen of we even een vreugdedansje doen, op die manier zou ik het doen.
Ik snap dat tegenwoordig technologie alles is hoor, maar dan zou ik misschien nog eerder als laatste de technologie doen. Dus als laatste een filmpje als je van alles een hapje hebt gehad. Dat het filmpje iets minder belangrijk wordt maar dat het beloningsysteem vanuit ons 'Yes je hebt het goed gedaan', we doen even een vreugdedansje of papa trekt een gekke bek, we doen even een high five. Dat soort kleine dingetjes, dat zou ik persoonlijk, maar ik denk dat andere mensen dat anders doen. Dus je zou dat gewoon heel breed kunnen maken. Dus met een beloning van wat voor manier dan ook.

Denk je dat je kind dit saai zou vinden na een paar keer?
Dat niet perse want het feit dat, hij met een dobbelsteen mag rollen dat vind hij leuk. Maar je moet het niet 5 weken lang dag-in-dag-uit doen. Als je dit bijvoorbeeld een of twee keer in de week doet, dan kan het. En dan voor de andere dagen dan verzin je wel weer wat anders. Ouders zijn daar creatief genoeg in. En er zijn ook dagen dat je bijvoorbeeld maar een ding eet, zoals pannenkoeken. En dan is het niet handig, want dan heb je in elke vakje hetzelfde en dan heb je ook weer zoiets van 'are you kidding me'. Dus ja ze zijn wel slimmer dan dat je denkt, Ik zou het echt wel een keer in de week kunnen doen, max twee keer, vaker niet want anders wordt het too much.

Hoe zou je dit ook zien binnen de eetsetting?
Ja dan zouden we het allemaal doen, Ik denk dan wel inderdaad dat het ook aanslaat als hij ook ziet van he wij doen het allemaal. Dat dat wel aan zou slaan. Alle kinderen zijn gek op spelletjes. Ik denk wel dat het op deze manier goed zou gaan.

Wat vind je van het bord?
Ja opzicht duidelijk, Ik zit alleen te denken aan de vaat, wordt het schoon. Als je dit al zou doen, zou je ook een of twee borden kunnen geven waar alles vast zit. Het kan wat smeren. Ook dat je het weer moet schoonmaken en zo en ieder dag op nieuw alles moet afwassen en zo. Vervaagt de kleur niet? Dat soort dingen. Een andere ding waar je rekening mee moet houden is dat sommige kinderen vinden het heel vervelend om van kleurtjes te eten. Dus dan zou je kunnen kiezen voor alleen de rand en de rest namelijk wit. Want het kan namelijk heel erg tegenstaan om bijvoorbeeld tomaten van een oranje stukje af te eten. Voor sommige kinderen is dat een bepaalde prikkel dat het niet klopt. Met de kleuren en zo, denk ik dat het wel een beetje overprikkeld is, als het hele bord is. Dus met alleen de rand geeft het iets meer rust. Als je dan tomaten hebt met een stukje vlees en aardappels nou aardappels zijn al geel, vlees is bruin, groente heeft alle kleuren van de regenboog plus dan nog meer kleuren. Wordt het kind heel snel overprikkeld.

Wat vind je van de animaties?
Ik vind de animaties wel heel leuk gedaan. Het is ook echt heel leerzaam. Nou ja het is ook aan de ene kant heel leuk dat je het op het eten betrekt, maar aan de andere kant zou je het ook kunnen afleiden van het eten. Ondanks dat het eten wel belangrijk is, als je er op blijft hameren, dan gaat het mis. Dat zie je bij heel veel kinderen met eetproblemen. En ook bij hem, hij vindt het helemaal geen probleem om te eten op het moment dat je niet kijkt, mits jij wegkijkt. Maar op het moment dat je erbij zit, '*the child's name*' kom eten, eet nou is even door, eet je mond nou is even leeg. Die kan zo een half uur met een hap in zijn mond blijven zitten. Omdat je daarop blijft hameren. En op het moment dat er ook nog een filmpje is die hamert op het eten. Dan heeft hij zoets van he fuck you. Als het dan echt om een eetprobleem gaat dan zou ik inderdaad daar iets anders neerzetten. Misschien een idee bimie-boo. In de app-store het zijn kinderspelletjes. En heel educatief en super simpel. Super simpel animaties vindt hij heel fijn.

Denk je dat de animaties ook te makkelijk zijn kwa denkniveau?
Het ligt er aan wat voor leeftijd de doelgroep is. Want ik snap dat het gaat om kinderen met Autisme, maar die zijn soms best wel heel slim. En die zijn best veel met zichzelf en veel minder met andere dingen. Dit is voor heel veel kinderen echt te simpel. Je zou het nog uitdagender kunnen maken door bijvoorbeeld nog een keer te kunnen drukken op het goede antwoord. Maar dat alle antwoorden eigenlijk gewoon goed zijn. Dat het net iets meer uitdaging heeft.

Van het bordspel, wat vind je van de lay-out?
Heel groen. Misschien wel te groen. Kinderen letten op dominante kleuren, groen is wel een dominante kleur. Ik zou hem zelf iets minder groen maken, bijvoorbeeld deze kleur groen (lichte groen van het bord). Ik zou dat iets meer toepasselijk te maken, om het mom Grass. Maar misschien is een blauwe lucht met een paar wolkjes beter. Dat je iets meer rust hebt. Hoe krijg ik iets meer rust op tafel. Dus ondanks dat het natuurlijk op moet vallen, komt het weer terug op de prikkels. Dus dan kan je beter deze kleurtjes (stippen) wat feller maken en de achtergrond wat lichter.

Ziet u zichzelf dit spel gebruiken?
Ja, zelfs zo wel maar ook als jij zegt, als je wat aanpassingen maakt dan denk ik wel dat het effect heeft.

Wat voor cijfer zou je het geven kwa effectiviteit?
Dat vind ik heel lastig omdat ik het dus niet echt heb kunnen uitproberen. Maar dan zo ie zo wel een 6.5 of 7. Met uitwijking met de updates die je nog zou doen.

Interview 2

Dan is het dat je zelf op ieder bord wat doet zeg maar? Of staat het nog voor een bepaald voedingsmiddel? *-ja*
Ja leuk ik vind het idee heel leuk. Ja absolute, ik denk alleen dat als ik naar mijn dochter zou kijken, dat zij misschien zo een animatie niet voldoende beloning vind om een hap te doen van iets wat zij echt niet wil eten. En op het moment is het daarmee heel lastig. Ze is niet autistisch maar ze eet gewoon bijna niets meer. Witte macaroni met ketchup wil ze dan eten als wij eten, en met sausjes en zo dat moet allemaal niet. Ik denk niet dat zij dat gaat doen voor zo een filmpje, dat is alleen mijn dochter.

Wat zou je denk je veranderen hiervan om dat wel te doen?
Als ik naar mijn dochter kijk die is van heel erg wel van de beloningen met stickertjes. Als je dan genoeg stickers hebt dan mag je dan een klein kadotje of weet ik veel wat. Weet je we zijn nu net gestart met dit traject ook, we hebben net een eerste kennismakingsgesprek gehad. Als ik naar mezelf kijk dan wil ik niet gaan belonen met kadootjes om haar maar te laten eten, want dat vind ik te ver gaan. Want ik vind kadootjes omdat een kind eet, nee. Dus ja ik vind dit heel leuk. Alleen ik denk dus dat het voor mijn dochter niet genoeg is om haar te laten eten. En dat is mijn dochter en voor andere kinderen zou dat gewoon heel anders zijn.
Dat heb ik ook wel terug gekregen van andere ouders. Maar dan is de vraag wat dan wel?
Ja lastig, mijn dochter is helemaal gek op YouTube filmpjes kijken. Ze doet nu een spelletje Roblox is dat en dat vind zij helemaal leuk. Voor haar zou het een beloning zijn dat ze dan een YouTube filmpje mag kijken, maar ja dat zou ik niet na eet hap doen, dat zou ik dan na een rondje doen.
Als we het spel zouden rond gaan? hoe zou je starten?
Ik zou misschien een dobbelsteen gebruiken waar er kleurtjes opstaan in plaats van met nummers, maar dat is misschien ook makkelijker voor de wat jongere kinderen als je een dobbelsteen pakt waar de kleurtjes op zijn. Als ze gooien dat het dan oranje is en dat ze dan op de eerst volgende oranje vakje landen. En dan mogen ze weer gooien en dan komen ze op de eerstvolgende kleurtje die ze dan gooien. Dan je zit je alleen met deze (de dobbelsteen vakje) dat je daar niets mee kunt.
Maar dat kun je misschien ook zeggen van dat passen we aan per leeftijd. Want mijn dochter kan prima tellen dus die kan prima zo. Maar voor de kindjes die wat jonger zijn die twee of drie zijn dat je dan zo een gekleurde dobbelsteen pakt, dat je het aanpast aan de leeftijd. Verder vind ik het concept heel leuk, ik weet alleen niet of mijn dochter dit zou doen.
Hoe denk je zelf dat het zou kunnen bijdragen aan het eetgedrag van jou kind?
Als ik het bij mijn dochter zou doen, dan zou ik een app hebben met iedere keer als ze heeft gegeten, dat ze dan een stukje van een puzzel of zo komt, en als ze dus alle hapjes heeft gedaan dat ze dan dat puzzel in elkaar kan zetten. Of dat het uiteindelijke een filmpje wordt, dat je niet na elke hapje een animatie krijgt maar dat je van 'goed gedaan' of zo en als je alle hapjes hebt gedaan dat er dan een filmpje komt, een leuk per leeftijdscategorie of zoiets. Of dat ze met elke hap een stickertje krijgen die dan open komt en dan inderdaad aan het eind van alle hapjes, ah weet ik veel, en als ze dan elke dag dat ze het heeft gehaald, dat ze dan aan het eind van de week, dat ze dan een wat grotere prijs of cadeautje krijgen, zoiets. daar zou mijn dochter het voor, die zou dit niet denk ik gaan doen. Maar die is ook al zeven, dus ik denk dat jongere kinderen dit wel al heel leuk vinden.

Want kinderen zijn ook heel verschillend en de leeftijden allemaal.

Gebruik je ook negative reinforcement bij jou kind?
Weet je we zijn nu zoekende, maar dat wordt dus nog allemaal aangepast na de observaties. Wat ik nu doe is dat ik zeg, oke je mag nu opscheppen zo veel als je wil, maar je gaat wel wat proeven. En als jij dat wat je op heb geschept niet opeet dan krijg je de volgende dag niets lekkers. Alleen dat is in de praktijk heel lastig, want dan gaat ze bij een vriendinntje spelen of oma komt langs en die heeft wat lekkers bij zich en die geeft die dan toch. Dus in de praktijk werkt het gewoon niet

Wat vind je leuk aan dit idee in het algemeen?
Nou ja met de kleurtjes inderdaad, ik denk dat het spelender wijs wel iets is dat goed stimuleerd bij een kind. En nou ja zo een beloning in de vorm van een filmpje of zo, dat is ook heel leuk bedacht. Ik denk dat dat bij mijn dochter niet genoeg stimulatie zou zijn. Maar je kan natuurlijk dit spel gaan doen en zelf de beloning aanpassen. Ik vind dit systeem wel heel leuk, van goh als je op oranje komt dan moet je van oranje eten. Ik denk dat dat bij mijn dochter wel zou werken omdat ze nieuwsgierig is en omdat het nieuw is. Of het dan elke dag, dat denk ik dan weer niet. Als de nieuwigheid eraf is dat ze dan denkt van nee dit doe ik niet meer. Ja nou nu doe ik het niet meer.

Behalve de animaties en zo, wat zou je nog meer veranderen?
Nou ik zou dus de keuze bieden uit twee dobbelstenen. dat je dus echt voor jongere kinderen, voor hem bijvoorbeeld (kind van 2) dat je wat kleurtjes op de dobbelsteen hebt. Van ja oranje dan moet ik naar oranje. Voor de rest ja, misschien nog iets meer in het voordeel van het kind in zit, want ze mogen een hapje weg geven als ze rond zijn. Dat ze er tussen door nog iets is, van hier geef een hapje aan je moeder, zoiets weet je wel.

Zou je iets anders ook toevoegen?
Nee, nee dat wat ik net zeg. Dat ze de keuze hebben van geef een hapje aan je moeder, want ik denk dat ze dat wel heel grappig vinden, van ha nu hoef ik zelf geen hapje en dan mag ik een hapje weggeven aan mijn moeder. Dat dat wat vaker er tussen zit misschien.

Denk je ook dat je kind het saai zou vinden na een paar keer?
Ja dat denk ik wel, omdat ze al wat ouder is. Ik denk dat voor jongere kindjes, meer geschikt is en voor autisitische kindjes die zijn natuurlijk misschien kwa leeftijd wat langer op dezelfde niveau zitten en dat dat ook weer anders is. maar als ik naar mijn dochter kijk dan denk ik dat die ook na een paar keer doet en er dan klaar mee is.

Dus de moeilijkheidsgraad is misschien wat te makkelijk?
Ja dat denk ik wel.

Kan je je voorstellen van een paar jaar geleden?
Als ik naar hem kijk (kind van 2 jaar), hij heeft geen eetproblemen maar ik denk dat hij dit heel leuk zou vinden. Dat je met een dobbel steen gooit en ja nu moet je een hapje van die, en ze leren daarmee ook de kleuren. Dus dat is ook leuk en ik denk dat het voor jongere leeftijden meer geschikt is.

En hoe zouden jullie dit spel toepassen binnen jullie gezinssituatie?
Meestal eet ik met hem (kind van 2) en mijn dochter. Als zij niet eet dat hij dan soms ook niet eet. Dus dan zou ik het omstebeurt en dan met twee pionettjes. En dan wie het eerste rond is. Ik denk dat dat ook voor de oudere kinderen wat meer uitdaging biedt en die willen graag winnen. Dus dat het met meerdere personen ook te doen is, en dat er wat grappige dingen in verwerkt zitten. Met een hapje aan de moeder of dat je de bordjes mag door schuiven of zoiets. Dat het iets uitdagender wordt voor oudere leeftijden.

Is dit spel ook vergelijkbaar met iets wat je eerder geprobeerd hebt?
Nee, maar we hebben ook niet heel veel geprobeerd behalve met beloningen en in de vorm van als je wel goed eet mag je straks een ijsje, weet je wel dat soort dingen. maar nee niet echt spelendewijs of op die manier iets gedaan.

En wat vind je van het bord zelf?

ja leuk, simple maar wel heel leuk. Ik zou misschien wel alleen maar de primaire kleuren gebruiken. Omdat dat bij veel dingen gebruikt wordt bij basis onderwijs en ook in het special onderwijs. Ik heb zelf stage gelopen in het special onderwijs dus daar gebruiken ze heel veel de primaire kleuren. Dat je oranje verandert in rood. Misschien is een hele kleur bord ook te veel voor autistische kinderen, ja dat kan. Of je moet bijvoorbeeld alleen de randjes gekleurd doen of een sticker er op. Ja voor mij stoort het niet, maar mijn dochter die kan dat wel aan. Maar ik kan me voorstellen dat autistische kinderen dat heftig vinden.

Wat vind je van de bordlayout?
Ik zou de achtergrond wat rustiger doen, wit of.. ik denk dat het nu wel heel groen is, of een wat zachtere kleur groen bijvoorbeeld. Dat de vakjes er wat meer uitspringen. Voor de rest prima.

Denk je dat het beter zou zijn met een groter bordspel of meer vakjes?
Beter misschien als het een andere route is of dat het niet een rondje is. maar ook dat weet ik niet want misschien is het voor autistische kinderen ook te veel. Maar voor mijn dochter die vind het misschien leuker als er wat andere gangetjes zijn of dat je er misschien tussendoor kunt of zo. Ik denk ook niet dat je het te ingewikkeld moet maken.

En wat vind je van de animaties?
Ik vind het idee heel leuk.
Zou je nog een ander onderwerp willen?
Ik weet niet hoe lastig dat is, maar dat je kunt kiezen uit leeftijdscategorie. dat je iets anders kunt kiezen voor kinderen van 3 dan van 8 jaar oud. En dat je echt in de leeftijdscategorie van dat kind een soort van animatie of beloning hebt. Dat zoiets nog een optie is.

Wat vind je van het gebruik van een telefoon binnen een spel?
Nou ja ik kan denk ik ook niet anders als je echt met animaties doet dan hoort dat erbij. Ik denk dat ouders het concept willen gebruiken maar niet met een telefoon willen zitten wel wat anders kunnen bedenken. Want ik vind het concept wel heel erg leuk, dus ja voor diegene die dit dan niet leuk vinden die kunnen altijd wat anders doen.

Ziet u zichzelf dit spel gebruiken?
Ik zou het zeker wel willen proberen ja, maar ik denk inderdaad dat mijn dochter, twee of drie keer doet en er dan klaar mee is. Ze is ook zo eigenwijs dat stel ze land op groen en er is iets wat ze vies vind, dan ja dan doet ze dat ook gewoon niet. Dan moet wel echt een hele goede beloning zijn, en soms zelfs dan niet. Ze zegt nu ook gerust van dan eet ik morgen gewoon niets lekkers, dan neem ik gewoon morgen gewoon niet iets lekkers. Maar ja het is wel iets wat ik zou proberen.
Wat voor cijfer zou je de effectiviteit geven?
Bij ons zelf denk ik dat het niet voldoende is als ik kijk naar hoe het nu gaat. Ik denk wel dat het zeker bij wat jongere kindjes echt wel effectief is. Ik zou het een 7 of 7,5 geven, ja zeker wel.

Interview 3

Wat vind je van het idee in het algemeen?
Ik vind het opzicht wel en leuk idee. Leg je dan bewust dingen op die ze niet lusten of ook dingen die ze wel lusten?
Ja ook dingen die ze wel lusten. Groen is wel bedoeld voor groente, oranje voor carbohydrates en blauw voor proteïne, maar daar hoeft niet per ce aan gehouden te worden. Behalve de groente is wel echt voor groente.
Ja ik denk wel dat mijn dochter dat heel leuk vindt. Die is wel van de spelletjes maar dan moet er wel dingen tussen zitten die ze wel lust. Ik vind het opzicht wel een leuk idee.
Wat zou je eraan veranderen?
Ik denk vaker dat je een hap mag weggeven ertussen doen, want stel dat je de hele tijd lage getallen gooit dan duurt het best wel lang voordat je daar komt. Dus dat je de kans er tussendoor wat vaker doet in plaats van een keer.
Zou je iets toevoegen?
Nee nou eigenlijk niet. Ik heb niet het idee dat er iets mist. Alleen het handje er wat vaker tussen doen denk ik.
Hoe denk je dat het idee zou kunnen bijdragen aan het eetgedrag van jouw kind?

Nou ik denk wel dat het spelenderwijze gaat, en dat ze daardoor wel gemotiveerder wordt om iets te gaan proeven.
Hoe bedoel je precies met spelenderwijze?
Ze vindt eigenlijk spelenderwijze dingen proberen vindt ze leuker dan als ze ook echt gaat zitten en dan gewoon dit moeten eten. Dat wordt hem niet zijn we nu al achter.
Want hoe oud is ze?
Ze is acht.
Wat denk je dat je kind van dit spel zou vinden?
Dat ligt eraan hoe je het gaat laten zien, ik denk de alle eerste keer dat je alleen het spel moet doen, met alleen maar dingen die ze lust. Dat ze het dan leuk vindt, en dat je dan langzaamaan elke keer een bordje vervangt met iets wat ze niet lust. Als ik haar een beetje ken, dat ze dat op die manier dan goed vindt. Als je direct vier bordjes neerzet met dingen die ze niet lust, dan is de kans van slagen heel klein, of eigenlijk niet.
Denk je dat je kind dit saai zou vinden na een paar keer?
Ik denk dat op de manier dat ik in mijn hoofd heb, met te beginnen met dingen die ze wel lust. Als ik zou beginnen met dingen die ze niet lust, dan zou ze het gewoon niet meer doen denk ik. En als dat saai is of meer van 'ja hallo dat zijn allemaal dingen die ik niet lus'. Dat je dan alleen maar weerstand hebt.
Wat denk je over de moeilijkheidsgraad?
Het is opzicht niet moeilijk, het is wel duidelijk. Het is denk ik zelf de motivatie van het kind om elke keer wel die lepel te pakken. Ik denk dat het daar al de moeilijkheidsgraad zit.
Want denk je dat het te makkelijk is, zou het wat meer uitdaging kunnen hebben?
Nee want ik denk dat de uitdaging al zit in het eten zelf. Ik denk dat het dan te veel gaat worden misschien.
Hoe zou het spel binnen jouw gezins-eetsetting passen?
Ik denk dat als we dit zouden doen, dat we ook allemaal mee zouden doen met een pionnetje, om er dan ook echt een gezamenlijk spel van te maken.
Dus ook allemaal apart je eigen bordje?
Nee gewoon hetzelfde bordje, dan elke keer gewoon een nieuwe lepel erop leggen. Dat je dan op die kleur komt dat de ouder dan ook een hap neemt. En ook bijvoorbeeld dingen erop leggen die wij ook niet lusten bijvoorbeeld, want dat weet mijn dochter precies. Dat ze ook gewoon weet dat het voor ons ook lastig is.
Wat voor methodes heb je eerder geprobeerd met je dochter?
Wat niet? Ze heeft een heupoperatie gehad waarbij haar keel is beschadigd. En toen heeft ze fruit gegeten en toen is eigenlijk, ja ik noem het eigenlijk min of meer in haar hoofd gaan zitten, dat het gewoon zeer doet, dat die smaak gewoon niet meer goed is. Ze heeft daarna ook overgegeven en zo. En sinds dien at ze geen fruit meer, dus dan zijn we naar de diëtiste geweest, en die zei dat we meer moesten dwingen met het eten. Dat hebben we dus gedaan met het gevolg dat ze ook geen groente meer at. En aan het einde at ze alleen maar brood en aardappelpuree en verder ook niets meer proberen. Ja snoep dat gaat altijd goed. Maar verder niet, en dan hebben we uiteindelijk alle druk eraf gehaald van ja wat je eet dat eet je en de rest, ja dan jammer dan. Daardoor is wel de druk van het eten af. En nu is ze dus 8, we zijn nu een half jaar wat meer bewuster mee bezig, ja nou dan denk ik straks ben je twaalf en je gaat ergens heen en je lust alleen maar aardappelpuree. Dat wordt wel een dingetje dan. En nu begint ze wel langzaamaan weer dingen te proberen uit zichzelf. En we zijn nu echt bezig met het proeven en ruiken en dan een keer met de tong erlangs heen, of er een keer op bijten, en dan vindt ze het wel weer echt best. En sommige dingen eet ze wel, dus opzicht ze eet al wel wat beter, en ze wil het proberen nu, want dat heeft ze ook heel lang niet gehad. Het komt ook echt van het niet dwingen.
Is dit spel vergelijkbaar met iets wat je eerder geprobeerd hebt?
We hebben eigenlijk nooit met een spel, alleen maar met gedrag verandering. En dan tijdens het eetmomenten. Dat was ook het advies om het op die manier het beste te doen.
Geef je ook beloningen en zo aan haar?
Ja maar daar is ze niet heel gevoelig voor. We hebben wel eens met sticker kaarten geprobeerd en zo, en ja dat gaat dan twee dagen goed en dan is ze er eigenlijk wel klaar mee. Om die motivatie in te zetten dat werkt nog niet zo heel goed. Dus echt een beloning letterlijk op dat moment dat werkt het beste.
Wat vind je van het bord zelf?
Voor mijn dochter maakt het niet heel veel uit kwa kleur en dat soort dingen. Maar ik kan me voorstellen dat er wel mensen zijn die het prettig vinden die verdeling en allemaal zo. Ja stel dat hier

gewoon een plaatje op had gestaan, dan was het ook goed geweest. Maar als je jongere leeftijd hebt dan sluit dit weer goed aan.
Zou je iets toevoegen aan het bord?
Nee vooral voor de doelgroep van autisme zou ik dat niet doen.
Hoe vind je dat het toevoegt aan het spel?
Ik vind het juist door de kleurtjes gecombineerd is het juist duidelijker.
Wat vind je van de animaties?
Ik vond net wat je liet zien wel grappig. Ik vind het juist leuk en het past ook gewoon bij het thema. Dus niet dat je daar in een keer wat anders hebt. En ook bewustwording van goh hoe groeit nou zoiets en waar. Ik kan me voorstellen dat sommige kinderen niet weten waar het vandaan komt.
Zou je andere animatie onderwerpen willen zien? Zo ja wat?
Misschien ligt het eraan hoe je het spel gaat inzetten, maar als ik kijk zoals bij ons, dat ze nog in die beginfase zit van alles oefenen en ruiken. En daar misschien een plaatje of animatie te laten zien van hoe je het doet, het eten dan. Ja weet ik niet.
Zijn er andere dingen die je kind motiveren om te eten?
Ja consequent blijven en verder ze is niet gevoelig voor als er andere kinderen bij aan tafel zitten. En dat die wel eten of zo. Dat maakt haar allemaal niets uit. Sociale motivatie helpt ook niet. En ook niet van je mag dit of dat na het eten.
Wat vind je van het gebruik van een telefoon tijdens het eten?
Ligt eraan op wat moment je vraagt, want tegenwoordig is er best wel veel met een telefoon en dat soort dingen, maar opzicht vind ik dit niet storend. Het is juist meer voor de ontwikkeling ook wetend waar groeit iets en hoe groeit het, ik denk dat het wel een goede aanvulling is.
Zijn de animaties op het denkniveau van jouw kind?
Ja zoiezo. Ik denk ook niet dat ze zou zeggen van goh dat is kinderachtig of zo. Misschien als ze het spelletje heel vaak gedaan had, dat het dan minder wordt.
Wat vind je van het bord lay-out?
Ik vind het goed, ik kan me voorstellen dat iemand met autisme dat het een beetje druk oogt. Mijn kind kan hier mee omgaan. Ik denk wel dat het beter zou zijn als het egaal is, die sprietjes kan wel heel erg afleiden. Want ik heb ook een client gehad die dan eerst naar elke sprietje dan zou moeten kijken. Vanuit die gedachte dat ik dan denk dat het te druk is. Maar aan de andere kant het zijn wel kinderen dus, misschien dat ze het dan wel wat leuker vinden daardoor.
Zou je iets veranderen?
Nee ik denk dat ik gewoon zo zou laten. Ik denk dat als het voor mijn dochter was dan was dit goed. Maar voor iemand met autisme zou ik dat denk ik aanpassen.
Hoe zou je dit spel gebruiken tijdens jouw eetsituatie?
Ik denk dat we het dan met zijn drieën zouden doen, niet tijdens een maaltijd maar gewoon een ander moment. Waarschijnlijk in het weekend gewoon of zo. En desnoods met chips of wat dan ook. Dat je het dan wel gewoon op een leuke manier inzet. Maar ook gewoon met groente of andere dingen die ze nog moet leren eten, wat wij fijn zouden vinden wat zij zou eten.
Zie je jezelf dit spel gebruiken?
Ja.
Als je de effectiviteit zou moeten inschatten wat zou je zeggen?
Ik denk dat het heel erg afhangt van wat er op de borden zit. Ik denk dat het heel erg afhangt van wat zij wel lust en niet lusten. En als dat dan opgebouwd wordt dat er dan wel een goede kans van slagen heeft.
Wat voor cijfer zou je het geven?
Ik denk zelf wel een 8.