Enhancing emotional development of 5-7 years old children with high functioning Autism Spectrum Disorder with the help of supplementary digital therapy sessions:
A case study of service system design

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Emotional development is a vital aspect of the social life of individuals, especially children with Autism Spectrum Disorder (ASD) since they struggle to recognize the feelings of others. In order to fully develop, a holistic approach to therapies is required including in-person therapies, home exercises, and social interaction. This study aimed to suggest a digital service system for supporting the development the children with the help of face recognition technologies. This study developed a service idea called Auxilium which provides online gamificated activities for children with ASD to facilitate their supplementary therapy exercises on desktop and mobile platforms. Auxilium is designed to be used by the children, their parents, and their therapists on the base of the human-centered and inclusive design approach. The therapy exercises are customized for each child by the therapist with the help of AI of Auxilium. The interaction method with the platform is facial recognition, and a prototype was evaluated by stakeholders with respect to effectiveness and usability. For the sake of user testing, semi-structured interviews were conducted with qualitative and quantitative questionaries. During the testing, a working prototype was used to investigate

usability deeply. The results were promising about the service in terms of answering the digital gap, being supplementary to the real therapies, motivating the children with gamification, decreasing frustration of therapies for the children, and creating a community with different stakeholders for Autism Spectrum Disorder. Consequently, this study suggests that digital games, which use facial recognition, can support the emotional development and expression of children while supporting their regular therapies.

ACKNOWLEDGEMENT

I am extremely grateful to Professor Valentina Auricchio, my supervisor, for her immense patience and feedback, which have been invaluable to me. Addtionally, my research would not have been possible without the generous support of Marco Morres, who has enlightened me about Autism Spectrum Disorder.

I would also like to express my gratitude to my friends and classmates for their unwavering support throughout this challenging and lengthy process. Finally, I must acknowledge my family, particularly my parents, brother, and sister, whose unwavering faith in me has kept me motivated and encouraged me to persevere. I am also thankful to myself for not giving up.

Intro

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Introduction

THE CORE

Starting from early ages, humankind has designed artefacts to contribute to their lives and improve their survival skills. In order to create artefacts, they need a cognitive process of observing, analysing, designing and creating. This neural process is also similar to human interaction and communication because the artefacts can be perceived as a way of communicating life. Therefore, the neural process and its development have always been a fascinating topic for academia and its literature. It is perceived as one of the fundamentals of human society and interactions within them. From the societal level to the individual level, neural development affects each connection between people therefore, the disorders in it impact each member. In this research, I focused on one of the most common neurodevelopment disorders which is an autism spectrum disorder (ASD). It affects about 1% of the world's population which is over 75,000,000 people (Borgi et al., 2022). From a designer's point of view, ASD is an interesting topic to investigate in terms of democratization and inclusivity for disadvantaged groups.

> *“Requiring very less substantial support a.k.a high-functioning ASD.”*

FROM SURFACE TO DEEP; AUTISM

Autism is a disorder that mainly is related to social and communication problems. These problems include repetitive and restrictive behaviors that can be at different levels depending on the person, therefore, it is described as a spectrum disorder abbreviated as ASD (Lord et al., 2018). The levels of severity are based on social communication impairments and the above-mentioned behaviors (American Psychiatric Association, 2022). There are 3 different severity levels of Austim depending on the requirement of external support to survive. The diagnosis process is determined by the doctors/ experts. The first level is called “requiring support” a.k.a low-functioning autism. At this level, the people have noticeable impairment in terms of social communication such as atypical answers and unsuccessful responses to social overtures from others. In terms of repetitive behaviors, people with this level have inflexibility in their behaviors, experience difficulties switching between activities as well as problems with organization and planning (American Psychiatric Association, 2022). The second level is called “requiring substantial support” a.k.a mid functioning autism. At this level, the people have marked deficits in verbal and non-verbal social communication skills. Moreover, limited initiation of social interactions and reduced or abnormal responses to social overtures from others are the visible differences. Furthermore, the inflexibility of repetitive behaviors, difficulty coping with change, distress, and/or difficulty changing focus or action are common symptoms of mid-functioning autism (Johnson & Myers, 2007). The ultimate level is called “requiring very substantial support” a.k.a high-functioning autism spectrum disorder. The aforementioned level includes severe deficits in verbal and nonverbal social communication skills as well as severe impairments in functioning, very limited initiation of social interactions, and minimal response to

Spectrum disorder

social overtures from others. Moreover, inflexibility of behavior, extreme difficulty coping with change, and great distress/ frustration/ difficulty changing focus or actions are common traits at this level (American Psychiatric Association, 2022). Although all these levels are requiring a holistic approach to understanding every person on the spectrum, I focus on high-functioning ASD in this research. High-functioning ASD has more emotional and cognitive symptoms which seems fascinating to make research about exclusively emotional development and empathy skills.

In the literature, autism spectrum disorder is notorious due to its difficulty to diagnose since it cannot be directly checked with a test like a blood test. The history of the children's development and behaviors needs to be observed and analyzed. Although it is important to detect ASD as early as possible for kids to support them to reach their

full potential, most of the time they get diagnosed at older ages. There are instances where children can be diagnosed between 18 months however the most reliable diagnosis is provided by the age of 2 (Hyman et al., 2020). Since the most significant approach is actively monitoring the development of the children, the children need regular checks with doctors or experts. This process can be identified as developmental monitoring and screening. The checks are expected to be executed regularly in 9, 18, and 30 months periods, however, The American Academy of Pediatrics (AAP) suggests detailed checks also in 24 months (Lord et al., 2006). During the screening sessions, the doctors/ experts go over some questionnaires and checklists based on their investigations and the performance of the children compared to other peers. The most used questionnaires are the Modified Checklist for Autism in Toddlers (M-CHAT) focusing on toddlers between 16-30 months, The Ages and Stages Questionnaire (ASQ), Screening Tool Autism in Toddlers and Young Children (STAT) which is more interactive including play, imitation and communication and Parents' Evaluation of Development Status (PEDS) which is parent interview. All these methods are common techniques however there are more depending on the doctors, regions, and countries. However, most of them are designed according to American Psychiatric Association guidelines. There are 5 main guidelines which are called DSM-5 Autism Diagnostic Criteria (American Psychiatric Association, 2022). However, these guidelines might differ from region to region depending on the regulations of a country. According to DSM-5 Autism Diagnostic Criteria, the first guideline includes whether the children have visible deficits in social communication and social interaction across multiple contexts such as social-emotional reciprocity, abnormalities in eye contact, and difficulties using & understanding body language/ gestures, adjusting behavior to suit various social contexts, lacking adjusting their behavior according to a situation, having difficulties to understand abstract concepts and maintaining friendships with peers. The second guideline includes current or history of repetitive patterns of behaviors, events, and activities such as lining up toys, echolalia, stress/frustration under transitions between habits or activities, intense focus on objects or restricted interests, and extreme reaction or non towards sensory inputs. The third guideline is abovementioned symptoms must be visible during early neural development. The fourth one is that the symptoms must affect the regular functions of their life. The last one is the fact that disorders cannot be explained with an intellectual disability however, ASD can also co-occur with other disabilities (American Psychiatric Association, 2022). Therefore, the screening sessions need to include other development tests to have a broader view of the current situation of the children.

After the diagnosis, the children are directed to therapies provided by public or private institutions. For instance, in Turkey, the government provides 2 hours of therapy for children who have public health insurance (Cavkaytar, 2015b), however, according to initial interviews, parents think this is not enough for a proper skill development process. Therefore, they prefer private rehabilitation centers which increase the gap between children who are of different socio-economical classes.

The democratization of the therapies turns out into an emerging topic from this perspective. The other example is the situation in Italy. Likewise, in Turkey, if a child gets diagnosed with ASD, they are put on a waiting list for rehabilitative centers (public hospitals)(reference needed). Depending on the level of severity, this waiting list is longer/shorter. If there is no place in public hospitals you may refer to other hospitals that have agreements with the government, claims one of the therapists in Italy who was a participant in the initial interviews. There are also private rehabilitation sessions from freelance therapists however, the economic gap between families determines the quality or frequency of the therapies that children with ASD get. In addition, in terms of economical aid, there are some funds that are provided either by the government or the region/city where the family lives.

In the literature on autism spectrum disorder, there are different methods of therapy depending on the expertise of the therapist and the needs of the children. The main therapy types are speech-language therapy, social skills training, parent-mediated therapy, occupational therapy, early intervention, behavioral management therapy based on applied behavior analysis (ABA), and physical therapy. The speech-language therapy includes verbal improvements with 1-1 sessions of activities such as naming objects, using words in sentences, or using images to communicate, etc. (Paul, 2008). Social skills training is a method to teach children how to interact within a real-life context such as handling teasing, behaving properly during play, etc. (Frankel et al., 2010). In parent-mediated therapy, the parents are taught how to facilitate therapies. Occupational therapy includes real-life exercises to teach children with ASD how to deal with daily activities such as taking bath, doing sports, etc. (Case-Smith & Arbesman, 2008). Another widely accepted therapy is applied behavioral analysis (ABA) which is promoting wanted behaviors and reducing negative behaviors. There are different versions of ABA such as positive behavioral and support (PBS) focusing on good motivations, pivotal response training (PRT) focusing on safe space based learning, the early intensive behavioral intervention (EIBI) focusing on a personalized collection of therapies and teaching, discrete trial teaching (DTT) focusing step-by-step learning with positive reinforcement (Behavioral Management Therapy for Autism, 2021). The last one is physical therapy which aims to improve the gross and fine motor skills of children with ASD. The abovementioned therapy methods are based on scientific research and include human interaction between the therapist and the children. Although each type of therapy includes human interaction and emotional expressions, there is no such therapy focusing only on emotional therapy. There is a case study about emotional therapy however it is focusing on traumatic experiences of miscommunication (Robinson, 2018). Emotions and facial expressions are the keys to creating better communication therefore, it is a critical aspect for children with ASD. They are usually taught during therapies and mimicking what they see from other people.

Recognition

DID YOU RECOGNIZE MY FACE?

The face is the main channel to express feelings and ideas for people as well as to understand others. Therefore, face plays a crucial role in our daily life. It became also an emerging topic in the digital technology field of facial recognition. The tech has become advanced over the years and is used widely on digital platforms. For instance, the filters that are extensively used on social media platforms for entertainment are based on this tech, also facial identification on smartphones is a product of this technology. In addition, artificial intelligence (AI) models can collaborate with facial recognition to understand which gestures are related to specific expressions, such as smiling is mostly related to happiness. Facial recognition tech is, briefly, one of the biometric identification methods based on the face of the people (Kaur et al., 2020). The process of facial recognition includes five essential steps, according to Kaur. The steps are image capturing, face detection, feature extraction, database matching, and person identification. The abovementioned steps are done by software systems, therefore, accuracy and effectivity depend on hardware and software quality. In spite of the fact the hardware and software are significant to recognize the face, the faces themselves have deeper issues to investigate. The face recognition algorithms might have problems related to illumination conditions of the environment, the pose of the face, facial occlusion, expressions differentiation, hairstyle, and age (Kaur et al., 2020).

Due to the fact that age plays a significant role in facial recognition technology, the researchers categorize different groups of age to work with. Moreover, each range of age requires different treatment in terms of software algorithms and machine learning databases. In 2022, a group of researchers published a case study which is kids' emotion recognition using various deep-learning models with explainable ai. The case study aimed to improve the experience of digital platform interaction for kids aged between 7-10. In order to do so, the researchers tried to understand the mood of the children during sessions with the help of facial recognition and explainable AI. It is claimed that understanding the mood and emotions of children is helpful for educational purposes as well as digital socializing (Rathod et al., 2022). In the research, the process of the understanding mood of the children is divided into 4 layers which are face

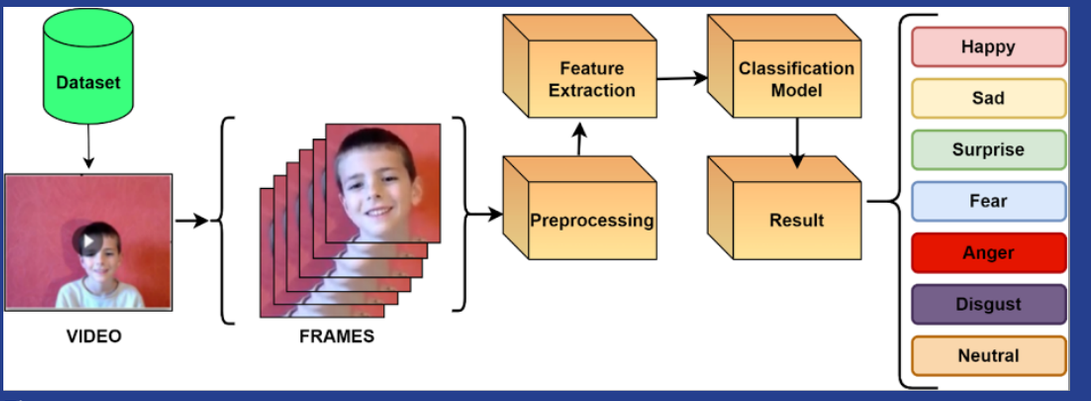


Figure 1

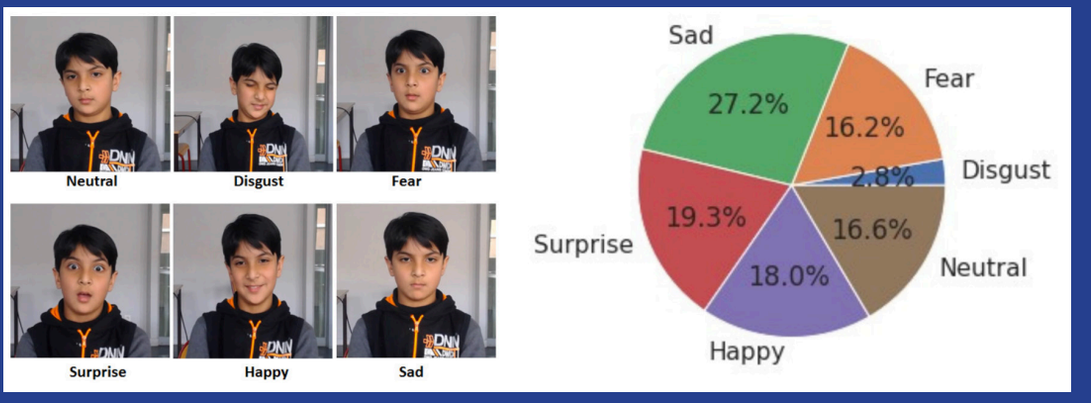


Figure 2 (a,b)

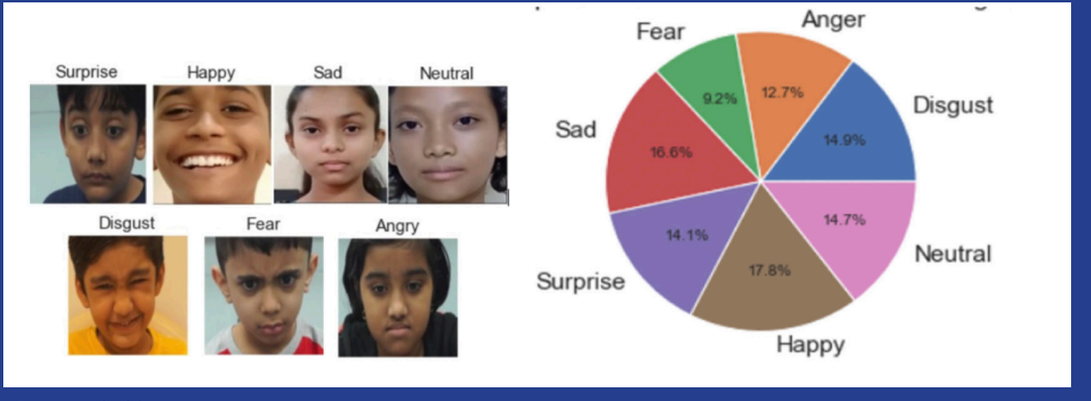


Figure 3 (a,b)

detection from data, processing the data, feature extraction, and emotion classification. From Figure 1, it can be understood that the process is multi-layered and complicated however, the most basic layer is the detection of facial components including the eyes, cheeks, eyebrows, mouth, and chin. Apart from these components, in the secondary layer, the information on features of various face parts such as facial landmark points, face construction, and the gesture of the face, etc. are extracted (Rathod et al., 2022). The information is used to train the AI model to detect the emotions of the children better.

In the research, the classification of emotions is the main concern which leads researchers to find out how to distinguish basic emotions. In the name of finding a better solution for distinguishing, two main data set has been used to train AI which is the LIRIS data set and the author's own data set. The LIRIS data set contains 206 video clips of 12 subjects with 24,000 emotional frames at a 30 fps rate. Figure 2 (a) is the publicly allowed sample image of the emotions in the LIRIS dataset. According to the LIRIS data set the AI can detect emotions with different percentages as highlighted in Figure 2 (b). The disgust expression is the most difficult emotion to realize for an AI to recognize; whereas, sadness is the most recognizable expression among all (Rathod et al., 2022).

The contrary to LIRIS data set, the author's own data set promises more accurate results with a high potential of correct detection. The dataset the author has composed of 81 videos of 12 subjects with 12,000 emotional frames at 60 frames per second. Although the same basic emotion expressions are used in the dataset in Figure 3 (a) compare to the previous dataset, there is more balanced emotion detection by the AI. In this case, the most recognizable emotion is happiness, while, fear has the lowest percentage (Rathod et al., 2022).

In accordance with the research, it is highly significant which type of data set is used as a base to train AI for facial recognition. Depending on data sources, the success rate of the emotion classification differs (Rathod et al., 2022). For instance, the author claims that live recording of visuals and sound helps AI to classify emotions with a success rate of 98%; on the contrary, still, images or videos get a success rate of 78-95%. Therefore, it is highlighted that different methods of using datasets affect the quality of the classification of emotions for children. Therefore, live interactions create better solutions for the user experience of digital experiences. To sum up, classification of the emotions is critical and beneficial for children while getting educated or entertained. In order to determine the mood of children, the software of facial recognition is beneficial and improves overall practice. Therefore, there is an immense potential of this technology to create interaction for children with autism spectrum disorder. Moreover, such technology provides a new way of learning of gestures and mimics while mirroring children's images on the screen; as a consequence, my research on emotional development for kids with ASD can benefit from this method.

WHAT DESIGN HAS TO DO WITH AUTISM?

The design literature has been involved with autism spectrum disorder due to the fact that inclusive design approaches. The purpose of design is to create better experiences for all and designing for vulnerable user groups is one of the key features of creating a better solution for all including non-vulnerable users as well ("The Curb-Cut Effect (SSIR)," n.d.). There are both physical products and digital ones designed to improve the lives of children with ASD. However, since this research is about digital approaches, the focus is on mostly digital solutions where children have screen interaction. I have selected two insightful examples as case studies to understand the current situation of digital solutions for ASD.

The first instance is called LOLA, or Laugh Out Loud Aid, which is an abbreviation designed in 2015. Tech Kids Unlimited, a non-profit organization dedicated to technology education, founded LOLA in order to use comedy to address the social and emotional needs of people with ASD and other neurological and learning disabilities (Unlimited, n.d.). Since abstract concepts such as humor are difficult to process for children with ASD, LOLA helps as a task reminder with positive feedback to motivate children (Figure 4). Motivation is essential for children with ASD to perform tasks without frustration. It is important to customize the experience according to their goals or preferences since children with ASD have distinctive and limited preferences on certain topics such as eating and playing. Moreover, since it is free for users, it can reach a wide range of end-users.

Otsimo is another successful instance as a case study because of its inclusivity and custom approach. Otsimo is a startup company established in 2016 that has a series of multi-platform mobile applications to help speech therapy and improve verbal skills with games (About Us & Our Story | Otsimo, n.d.). The company developed more than 50 games to support children with various conditions. During onboarding, the app asks users to answer some questions to create a personalized path for the children (Figure 5). Each path has its own levels and monitoring schemes. The application sets goals for each child to improve their skills, however, this goal cannot be edited so there is a huge alienation of the children from the process itself. Although it can be downloaded free on platforms, it requires in-app payments which

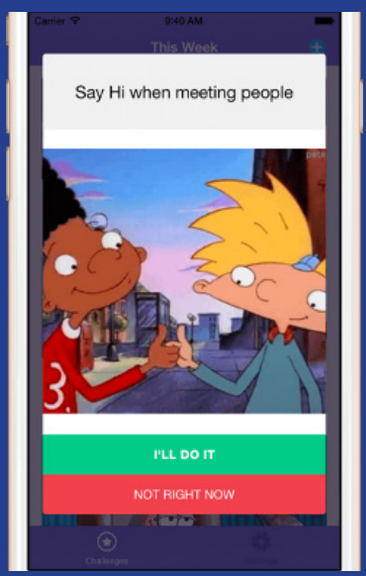


Figure 4

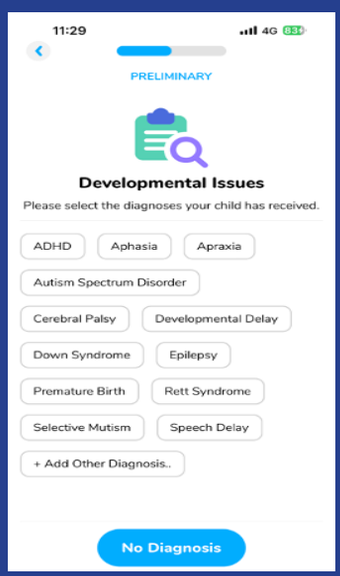


Figure 5

creates a gap between families from different socio-economic classes. In addition, the company provides subscriptions for schools to use its apps to help to the education process of any student. This subscription allows the schools to track children's development however, it is far from a professional aid or assistant (About Us & Our Story | Otsimo, n.d.). One of the gaps in Otsimo currently is lacking of direct communication between children, parents, and therapists/teachers/experts.

Nowadays, on the digital markets, there are other apps and games specifically designed for children with ASD however most of them are focused on speech, visual skills, and education. In spite of the fact that these areas of focus are significantly essential, emotional expression or development is usually neglected by digital interactions. Since emotions have both psychological and physical aspects, it plays an extensive role in life as a source of motivation (Alexiou et al., 2012). Therefore, understanding the emotions of the children during digital interaction can alter the frustration of heavy cognitive load for the kids and can improve the overall digital experience.

Connecting the dots:

MY RESEARCHE QUESTION

The background information about autism spectrum disorder arouse my curiosity about the relationship between neural development and emotions. How emotional development and expressions are essential for the children to create bond with others and improve social interactions. Although, social skills improve with real life experiences, digital interaction can simulate the real life experiences for the wider audience. Therefore, digital products or services can help children with ASD to enhance their social abilities. From this perspective, I want to research extensively on how might we support emotional development and emotional expression for the 5-7 years old kids within high functioning autism spectrum with the help of digital interactions? The digital interaction that I envision includes using AI integration by using facial recognition to facilitate digital supplementary therapy sessions. These sessions contains personalized therapy games on weekly basis. Starting with this base idea, a complete service idea is developed around the children. My research question tackles also larger concept of experience of a service for all the stakeholders such as therapists, parents, even governmental institutions. This happanes since autism spectrum is not only related with individual effort but also collective effort connected with external factors in children's life.

how might we support emotional development and expression for the 5-7 years old kids within high functioning autism spectrum with the help of digital interactions?

Design Strategy

Agile Experince

Figure 6

ILLUMINATING THE PATH: DESIGN STRATEGY

The design strategy is the core of a research or a project. It helps to understand what could be the best way to approach research question. The research question I have mentioned above require more flexible attitude due to fact that there is not certain design solution for my research question. While working with uncertainty, agile design methodology is the best way to start thinking since it allows researchers to be more iterative and evolutionary (Fard, 2020). According to Fard, the agile design process has seven continuous steps which are understand, research, sketch/concept, design, prototype, test, refine. These steps follow eachother until reaching the optimum solution for the desired results (Figure 6). To reach such desired results conventional waterfall methodology becomes less useful because it is difficult to recover from errors on the process or adapt to fast changes. However, figure 6 shows the flexibility and adaptive approach of agile design. Therefore, for this research project, I use the agile design process to create an embracive solution.

Understand

For the sake of understanding the current situation, initial interviews with therapists and parents were suitable option for my research. Although I wanted to focus on international overview of ASD in order to have a broaden vision, I could only contact a parent and a therapist in Turkey. According to interviews, I realized the importance of having close contact and collaboration with therapists during the project which perfectly fits agile design strategy I set.

Research

For research part, literature review and desk review have been done. In the next chapter literature review is examined deeply in terms of digitalisation of the games and therapies and emotional development of children with ASD. The desk review is helpful to the desk review is helpful to understand what we can do to provide better opportunities for kids with autism. As a tool make research, I use google scholar search engine and related websites. In order to collect the articles, store and cluster them I use Miro. After selecting most related articles to my research question, I find common features to categorise them. Then I focus on most promising aspect of my research.

Sketch/Concept

The sketch step of the research includes idea generation based on insights of previous steps. According to insights of literature and desk review, I find gaps and opportunities. For the concept generation process, I use Miro board as well.

Design

In the design step, I make search about how to execute an user interface and user experience for the children between 5-7 years old with autism spectrum disorder. Since the target group has some challenges, inclusivity and accessibility are the key feature for the design. In similar to previous steps, I use Miro for the design execution.

Prototype

The prototyping is the most critical step in the research because it determines whether my concept idea works as intended or not. In order to create complete user experience, it is significant to manage a working prototype with all the interaction styles envisaged such as facial recognition and touch control. In the prototyping process, Figma is used to create working mock-up and for the facial recognition interaction a tool called Morphcast Studio.

Test

User testing is the core of design sprints since it provides real life feedback from the user group. For the sake of getting insightful feedback, I plan to collaborate with children who has autism spectrum disorder. In order to reach the children, I arrange a collaboration with a rehabilitation center in Turkey. I plan user testing both online and presence since I work with people from different countries. In the user testing, there are two steps which are prototype experiement and interview. Both steps help to understand what goes well and can be improved. The testings are done with Figma and web browser that can use camera and speakers of the devices.

Refine

In the refinement step, I use feedbacks and comments to revise the prototype to prepare it for the next design sprint. This step is where extra developments are added.

The research requires more then one design sprint, however, I have a time limitation of 6 months. Therefore, I can do only 2 agile loop. The design strategy of the research additionally consist of service design explorations to have a holistic view. In spite of the fact that the research question requires support from other fields such as frontend development, and psychiatry, I try to cover most of the prerequisite by myself with the research I make and by the therapists that work with children with ASD.

Should I put images here??????

Literature

Contents

DIGITAL TRANSFORMATION ON EDUCATION, GAMES, AND THERAPIES

GESTURE AND MIMICS: FACIAL RECOGNITION WITHIN AUTISM SPECTRUM

DESIGN LITERATURE DIFFUDING WITH AUTISM: A CASE STUDY

Literature Review

In the academic literature related to my research question, which is supporting emotional development and emotional expression for 5-7 years old kids with high functioning autism spectrum with the help of digital interactions, there are three main topics I want to explore extensively. The first one is digital education, therapies with games. I want to explore this topic because of the fact that digitalization in therapies/ education can improve motivation while reducing frustration. I want to learn how I can create a service where children feel less frustrated and are willing to continue using the service. The second one is the emotional growth of kids with ASD and how to express it. I want to deeply investigate this topic to have a better perspective on emotional development and facial recognition with the help of a case study. The third one is designing for autism. The third topic is essential because it creates the base for my research as a designer and I want to understand what kind of design approach can fit best to my research. In the

academic literature related to my research question, which is supporting emotional development and emotional expression for 5-7 years old kids with high functioning autism spectrum with the help of digital interactions, there are three main topics I want to explore extensively. The first one is digital education, therapies with games. I want to explore this topic because of the fact that digitalization in therapies/education can improve motivation while reducing frustration. I want to learn how I can create a service where children feel less frustrated and are willing to continue using the service. The second one is the emotional growth of kids with ASD and how to express it. I want to deeply investigate this topic to have a better perspective on emotional development and facial recognition with the help of a case study. The third one is designing for autism. The third topic is essential because it creates the base for my research as a designer and I want to understand what kind of design approach can fit best to my research.

> *“Repetition is the key factor to persistent behavioral change within ASD.”*

DIGITAL TRANSFORMATION ON EDUCATION, GAMES AND THERAPIES

In the literature review on the topic of digital transformation of education/therapies, I realise that the process of digitalization of education become an emerging topic during covid pandemic in 2020 (Bogdandy et al., 2020). Although the digitalization of education became a hot topic, the digital transformation of therapies is rooted in healthcare services (Belliger & Krieger, 2018). In the case of ASD, it is critical to have, one-to-one, in-person therapy sessions since children need to interact in order to improve their social skills (Sharma et al., 2018). However, children with ASD are expected to exercise also in their free time at home because repetition is the key factor to persistent behavioral change. Therefore, a home-based application can support the therapy process in the long run.

For instance, in 2019, a group of researchers made a research about wearable devices for children with ASD, titled as the effect of wearable digital intervention for improving socialization in children with autism spectrum disorder. This study highlights the potential of digital home therapy to supplement the standard of care by reinforcing facial engagement and emotion recognition, which suggests either or both could be a mechanism of action driving the observed improvement (Voss et al., 2019). In addition, the results are promising in terms of children’s engagement and desire to continue to practice therapies. The children’s engagement with home-based interactions can help to support their regular therapies (Voss et al., 2019). Therefore, I realized that digital services can increase the enjoyment of supplementary exercises to therapies with assistance for the children. During the literature review, I encounter a case study which is called Imutism. The service aims to educate ASD kids on how to communicate, use public transportation, get dressed and eat on

their own, ask for help, and many other basic skills (IMUTISM | Digital Therapeutic for AUTISM, n.d.). IMUTISM helps kids with ASD communicate and acquire life skills by utilizing video modeling and animated films. The service's digital imitation-based rehabilitative and training movies, which are created for all ages and levels of autism severity, enhance the quality of life for families with ASD. The Service contains a mobile and desktop platform for the children to interact with. The core idea of digital imitation helps children to experience simulated real-life occasions.

Deducing on the case studies, it is important to have an assistant or aid to direct the children to do the exercise or therapy practices. Moreover, in the introduction section, the mentioned case studies, are LOLA which is a task reminder with positive feedback to motivate children and Otsimo which is a series of mobile applications to help speech

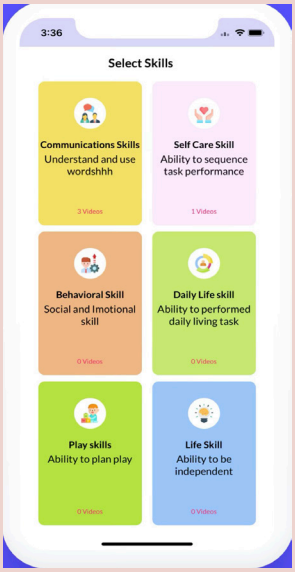


Figure 7

therapy and improve verbal skills with games, support idea of encouraging children with ASD with little stimulators. Although these applications and services are focusing on skill improvement and education, they are not a replacement for therapies. They can be seen as supplementary to real therapies. To reduce stress and frustration, the gamification method can be beneficial (Afyouni et al., 2017). Therefore, having an assistant/helper during the experience of the service and gamification of the therapies can increase the overall satisfaction of the service for children with ASD.

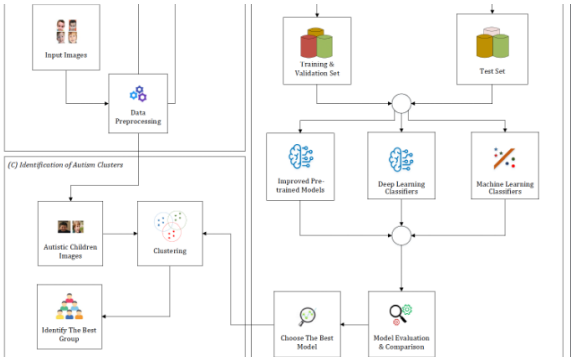


Figure 8

Another significant topic is facial recognition technologies for Autism. According to Hamillton, the recognition of six main emotions has different levels of understanding by the AI or facial recognition techs. The expression of fear is difficult to understand compared to happiness (Yang et al., 2018). There need to be guidelines for how to make machine learning better for emotions however at the basic level, it is proven that emotions can be captured by AI. For instance, there is research about using the help of AI to understand whether a child has autism or not. In this research, an improved transfer-learning-based autism face recognition framework is proposed to more precisely identify children with ASD in the early stages. Human faces encode important markers that can be used to identify ASD by analyzing facial features, eye contact, etc (Akter et al., 2021). Figure 8, it is displayed how facial recognition tech can differentiate children with ASD from all children.

Therefore, I deduce that the product interaction of my service can be facial recognition. Understanding the emotion of the children helps the AI behind the service to identify correct and wrong emotions according to the expected therapy exercise.

Recognition of emotions of the children helps the Artificial Intelligent of the service to evaluate, identfy, and clasify the current mood of the children.

The last topic is designing for autism which includes accessibility and affordability in terms of visual, verbal, and cognitive. The basic rules of user-centered design methods also cover designing for Autism. For instance, in 2020, Chung and Ghine made a research on human-centered design approaches for children with ASD. Based on the human-centered design methodology, a prototype for a mobile interface was created for this study, and its acceptability and usability were assessed by stakeholders (Chung & Ghinea, 2020).

According to the research, the logical sequence of the digital design is the key to creating a better product as well as colors need to be chosen according to the guidelines, and font size and copy need to be easy to understand. The screens, overall, should be cognitively light to create better dialogue. In addition to the previous case study, there is another one which is directly related to my research question. The aforementioned case study is called eMot-iCan, an emotion identification game intended to evaluate and maybe improve social accessibility in people with autism spectrum disorders (ASDs). The game tests the hypothesis that a number of the characteristics of ASD are caused by aberrant attention patterns (Sturm et al., 2016). They used trials created by subject-matter specialists to enable uniform, repeatable measurements across sessions and participants. The game is made to do more than just drill skills; instead, it tries to evaluate and personalize learning (figure 9). They tested the game with game administrators and players with a variety of talents and abilities for the evaluation and potential treatment of ASD. The player wears a colorful sock on her hand, and the software uses color tracking with a web camera to track her arm movements (Sturm et al., 2016). The primary objective of the emot-iCan game is to accurately assess emotion recognition abilities using a variety of stimuli. Another objective is to use multi-media input and output that is user-friendly and suitable for players on the autism spectrum (Sturm et al., 2016).

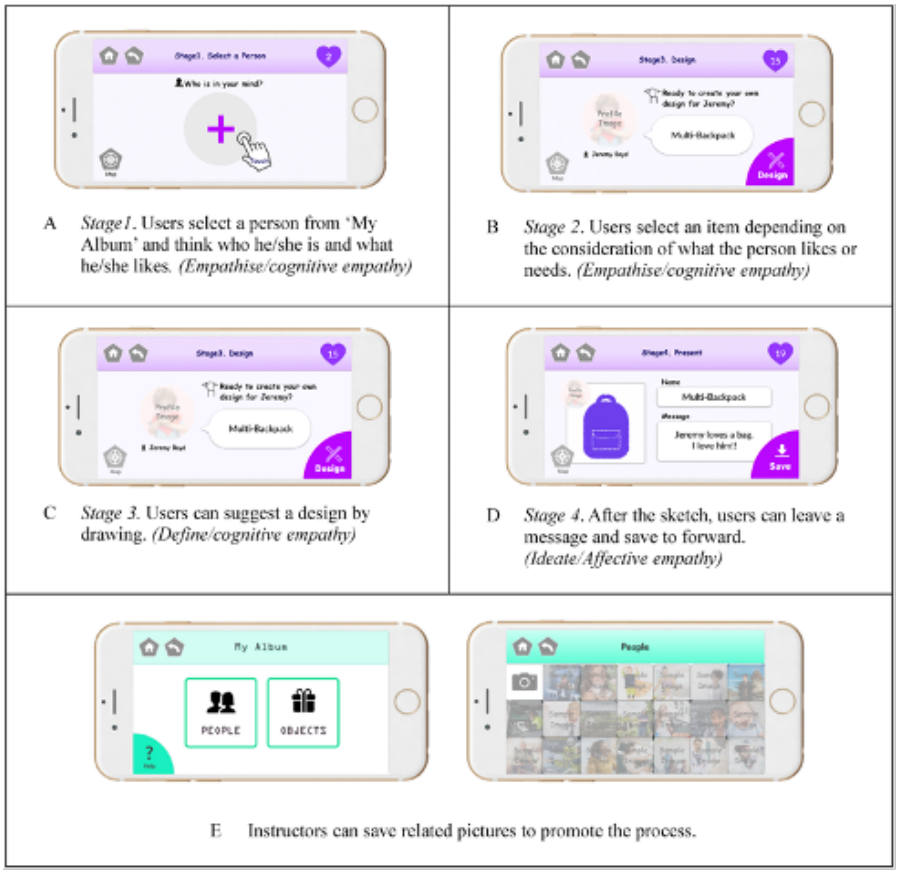
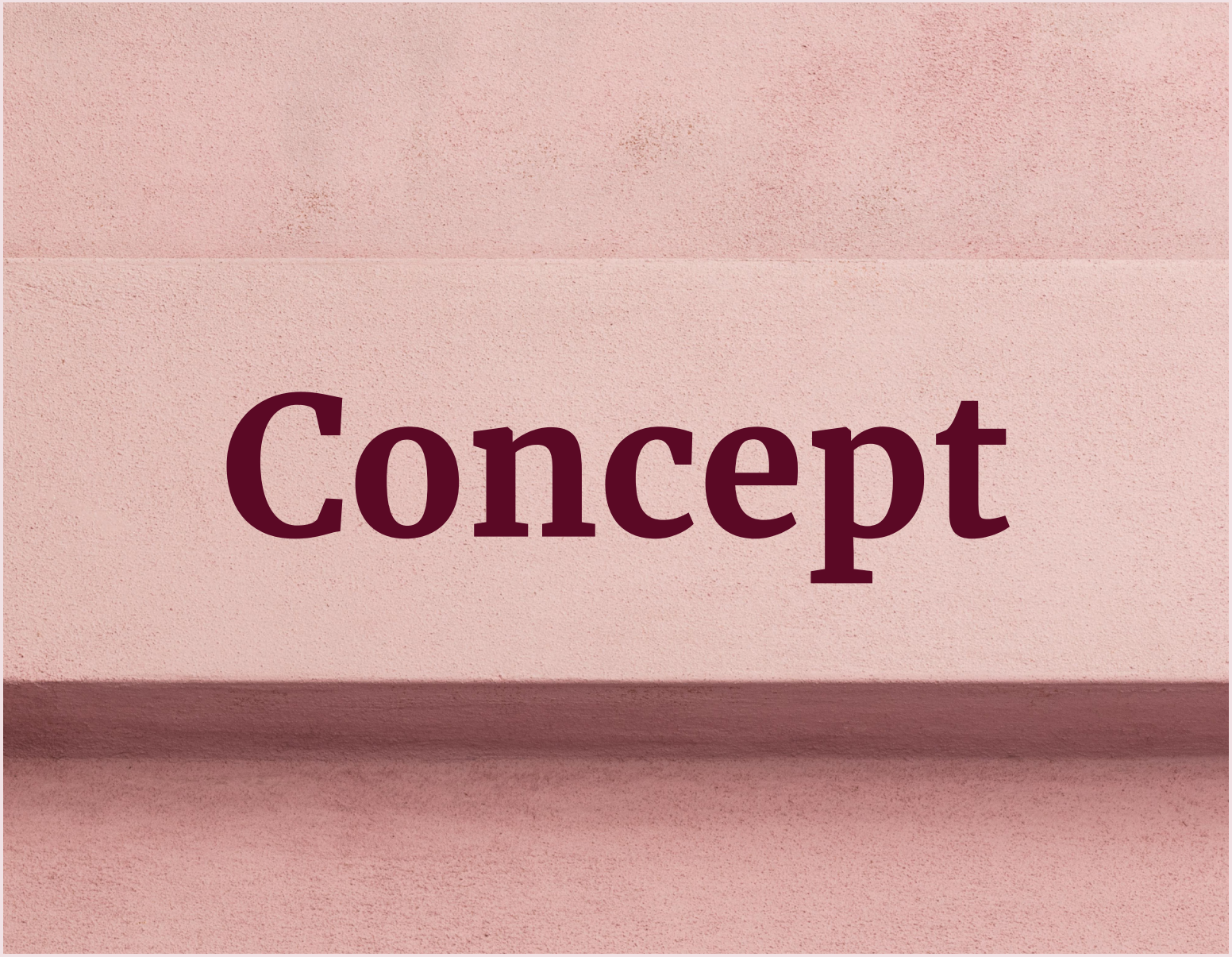


Figure 9

Figure 10 shows how machine learning can perceive the faces of the children in the system and classify them. The results of the paper support facial recognition technologies can improve the emotional education of kids with ASD as well as their social skills. Additionally, using real images of children with ASD to create the database for facial recognition result with outstanding outcomes. According to the literature review, I have started to shape my own concept to test my research question which is how might we support emotional development and emotional expression for 5-7 years old kids with high-functioning autism spectrum with the help of digital interactions.

Figure 10


Concept

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Axuilium

A SERVICE EXPERIEMENT

The answer to my research question is a service. Auxilium is a system/service for home-oriented regular gamified therapies which are supplementary to real therapies. The platform aims to support children between 5-7 years old who are diagnosed with high-functioning ASD. The service provides personalized therapy exercises according to each child's needs determined by her/his therapists. The system also enhances the relationship between the kid and the doctors/experts because the integration of the therapies not only in facilities but also at home allows therapists/doctors to create a stronger bond with the children. Nevertheless, the children need more than a strong bond with their therapists. The situation with Autism Spectrum Disorder requires a comprehensive overlook and collaboration for long-term improvements. Therefore, as a society, each member has a responsibility on a different scale to make the life of children with ASD better and easier.

STAKEHOLDERS MAP

In Auxilium ecosystem, each stakeholder plays a significant role due to their needs, values, and attitudes. Furthermore, the service includes different stakeholders at different levels (figure 11). On the individual level, the service itself, the children, their parents, and their doctors/ therapists. The Auxilium has needs such as users and data as well as profit to improve itself constantly. The values of it are trust, optimism, and communication. According to these values, the attitude is understanding the needs of the users and advocating neurodevelopmental disorders starting from Autism Spectrum Disorders. The other first level stakeholder is the 5-7 years old children who are diagnosed with Autism Spectrum Disorder. The children have values of unconditional acceptance, empowering themselves, and having meaningful social interactions. The attitude of the children differs from each, nonetheless, there are common ones such as repetitive actions, and having less social interaction compare to peers. The parents of the children have needs of acceptance, understanding, and acknowledgment of ASD. In addition, they value the fact that their children improve herself/himself more and their children have less need for their parents to survive in long term. The attitude of the parents composes not only trying to do best for their children, such as spending effective time with them and trying to find the best therapy but also decreasing their stress and anxiety levels for themselves. Furthermore, on the first level, the therapists/ doctors need to observe the improvement of the children constantly and be connected with the children. Related to these needs, their values are creating a positive impact on the life the children and support their individual surviving skills of the children. The therapists and doctors have attitudes of being welcoming, understanding, and assisting. Those features create the best combination for creating collaborative solutions.

On the social level, there are well-being institutions such as rehabilitation centers, schools, and hospitals. The needs of those stakeholders are to create a better life for its members, to have funds to fulfill the needs of the children, and to have sustainable relationships with the kids as well as their families. Based on these needs and values, the attitudes of these stakeholders are engaging citizens to increase awareness, advocate, and provide spaces for the different needs of

Figure 11

children with ASD. On the city level, governmental institutions and NGOs are aimed to be included within Auxilium. These stakeholders usually need to understand the demand of the public and to fulfill the needs or gaps. They value transparency, being helpful, and making positive changes in the social perspective of Autism Spectrum Disorder. Moreover, they have more concrete approaches compared to other stakeholders since they work mostly on decision-making and policy design. They can create a wider impact on society even country-wide. Consequently, all these stakeholders play essential roles to improve the current life of people with Autism Spectrum Disorder without age difference.

PERSONAS

Personas are a key tool utilized in the field of user experience (UX) design to create a better understanding of the target users of a product or service. A persona is essentially a fictional representation of a typical user of a product or service, based on real user data and insights. It is used as a reference point to help UX designers create products and services that are tailored to the needs, goals, and behaviors of the target users. According to Alan Cooper, the creator of personas, "Personas are archetypal characters created to represent the different user types within a targeted demographic, attitude, and/or behavior set that might use a site, brand, or product in a similar way." Personas are created through a rigorous process of research and analysis, including interviews, surveys, and user testing. Therefore, in order to investigate the concept deeply, I created two main personas for Auxilium who represent target user-groups (Figure 12.

The first persona is called Lia. She is 5 years old and lives in Milan. She is a bright and curious child who has a lot of potentials, but her high-functioning ASD can make social interactions and emotional expressions a challenge. While she has made progress in therapy, her life has changed so quickly in terms of social interaction that she feels her therapies are not reflecting or adapting to her new conditions. As a result, Lia is struggling to connect with her peers, teachers, and family members, which can be isolating and frustrating for her. Attending school has been both exciting and overwhelming for Lia. On one hand, she enjoys learning new things and being around other children her age. On the other hand, she often finds it difficult to communicate and make friends, which can lead to feelings of loneliness and rejection. Lia's teachers have been supportive and understanding of her condition, but they too may struggle to fully understand how to best accommodate her needs in the classroom. Lia's parents have also been working hard to support her and provide her with the resources she needs to thrive. They take her to therapy sessions every week, but they too have noticed that Lia's interest on digital screens helps her focus on these activities more engaged. They worry about her future and how she will be able to navigate a world that can be overwhelming even for neurotypical individuals. Despite the challenges she faces, Lia is a resilient and determined young girl. She has a

lot of love and supports around her, and with the right interventions and accommodations, she has the potential to achieve great things. Therefore, she can improve her skills being a part of Auxilium while having fun with weekly exercises.

The second on is her parents who are Paul and Jenn. They are 40 and 38 years olds who works as marketing manager and NGO co-founder and live in Milan. They are parents who are deeply invested in the growth and development of their daughter Lia. They take every opportunity to spend quality time with her, and they are constantly trying to ensure that she has ample opportunities to interact with others, especially given her unique condition. In spite of the fact that they have busy work lives, which can be stressful at times, Paul and Jenn remain committed to creating a nurturing environment for Lia. They understand that her condition may make her more reliant on them for certain things, but they also want her to develop the skills necessary to become more independent in terms of social interaction and basic communication. In order to achieve this goal, Paul and Jenn have taken a proactive approach to Lia's development. They have sought out educational resources and programs that are tailored to her needs, and they have worked closely with her teachers and therapists to ensure that she is receiving the support she requires. One of the challenges that the facial expression of Paul and Jenn, is helping Lia understand their own stress and frustration. They realize that it can be difficult for her to comprehend their emotions, but they are constantly striving to find ways to communicate with her in a way that she can understand. Even though these challenges, Paul and Jenn are optimistic about Lia's future. They believe that with the right support and guidance, she will be able to overcome any obstacles in her path and become a confident, independent young woman. They are committed to providing her with the tools and resources she needs to succeed, and they will continue to work tirelessly to ensure that their child is in good condition. Consequently, These personas help to form the overall requirement management of Auxilium.

PERSONAS

Target Group

Persona #1 Lia

Lia Wonderer

First Grader with High Functioning ASD

Age:	6 years old
Occupation:	Student
Location:	Milan, Italy

Lia is a children who is diagnosed with high functioning ASD. She has started to school this year. She is able to speak and understand however she is struggling with deeper conversations where she exposed to emotional expressions/gestures. She likes to go to school but her condition affects her relationship with her friends, teachers and parents as well. She goes to therapy sessions every week but only 3 hours a week. However, her life changes so quickly in terms of social interaction where she feels her therapies are not reflecting or adapting to her new conditions.

Her pain points

- She feels alone when his parents are not home
- She likes to less oral communication
- She cannot remember the home works from the school
- She cannot understand his friends reactions

Her goals

- To have better understanding how people around her feels
- To express her feelings correctly
- To reason how and why people behave and how she should behave
- To have less stressful therapy sessions

Capabilities

- High level of usage of smart devices
- Low level of anticipation
- High level of memory

PSSD PRODUCT-SERVICE SYSTEM DESIGN POLITECNICO MILANO 1863 YAMK

Figure 12

Target Group

Persona #1 Lia

Paul and Jenn Wonderer

Dedicated parents to want best for their kid

Age:	40-39
Occupation:	Managers
Location:	Milan, Italy

Paul and Jenn are parents of Lia. They love to spend time with their kid. apart from daily free time, they try hard to create free time for Lia to interact with her especially focusing her condition. They have busy work lives where they have to take kare of most of the stress together as a family. Sometimes, they feel Lia cannot understand their frustration. They want Lia to improve herself and become more independent in terms of social interaction and basic communications skills.

Her pain points

- To help her to improve himself
- To become more connected with her teacher
- To balance work life and home life

Her goals

- They feel frustrating while doing home works with their kid
- They feel tired after work
- They cannot find correct source for her

Capabilities

- Low level of usage of smart devices
- High level of anticipation

SERVICE BLUEPRINT

A service blueprint is a critical tool for businesses looking to optimize their customer experience. It provides a detailed, visual representation of the various components that make up a service, including the people involved, the physical and digital props used, and the processes that underpin the service (Service Blueprints: Definition, n.d.). By mapping out these components and their relationships to each other, businesses can gain a comprehensive understanding of their service and identify potential areas for improvement. The key benefit of a service blueprint is that it provides a clear and concise overview of the customer journey, from start to finish. By focusing on the touchpoints that customers interact with, businesses can identify areas where they can improve the customer experience, streamline processes, and ultimately, increase customer satisfaction. Thus, Auxilium service requires multilayers of service blueprint scheme.

The service blueprint includes the steps/actions of the experience for the child, the parent, and the therapists (Figure 13). The pre-service part includes awareness step. In this step, the parents are expected to contact with an authorized doctor or therapist who is already a member of Auxilium service. The therapists/doctors inform the family about the service and how it works. After the positive decision of the family, the children and the family are registered by the experts in order to avoid random excessive application on the platform. Then, with the help of the platform, the experts execute the pre-evaluation test on children with ASD. In the pre-evaluation test, there are common questions to understand the level of severity and the capabilities of the children. In the meantime, the service algorithm, analyse the result and suggests a customised exercise path for each kid. In the path, the experts and the children need to collaborate to set common goal to achieve each week. Moreover, the engagement of the children for setting the goals help children feel motivated and less alienated from the service experience. The reinforcement map and logic is explained in upcoming sections. If the experts agree on the suggested path, they can continue with the next step, otherwise, the experts are allowed to edit the path. The nest step is receiving where the children are assigned daily and weekly activities. Then, there is finalizing the exercises step where the children are expected to collect stars by doing

therapy exercises at home individually. Then, according to weekly goals and earned stars, the children are given rewards at the physical feedback step. The nest step is called post evaluation where weekly success rate is evaluated by the service. The correct and wrong answers which are given by the children **while doing therapy exercises are turned into a success rate. Since the iteration of the service is facial recognition, the AI can detect the face of the children. Then, the algorithm analyses the data and create graph with peak/lowest correct answers per seconds as well as creates the data of focus time and eye contact time. Afterwards, the data is turned into visuals to share with the parents but most importantly with the experts. The parents can only monitor the data whereas the experts can not only monitor but also make adjustments for the activities of next week. If the children progress faster, the experts can increase the level of difficulty in therapy games and vice versa. The changes in level can be suggested by the service itself aswell as a suggestion for the experts nevertheless the final decision needs to be provided by the experts. The nest step is the customization of the service where the therapy games are adjusted according to needs of the children by the system or the experts. These last steps are continuous loops on weekly basis. After all these steps, there is post-service step which include customer service and loyalty. The users are expected to stay within the service as long as they like to use and the Auixlium customer services help with any problem the users face with. If the customers decide to cancel their subscription, they have to give feedback. All these steps can be done both on desktop platform or mobile device app.**

SERVICE BLUEPRINT

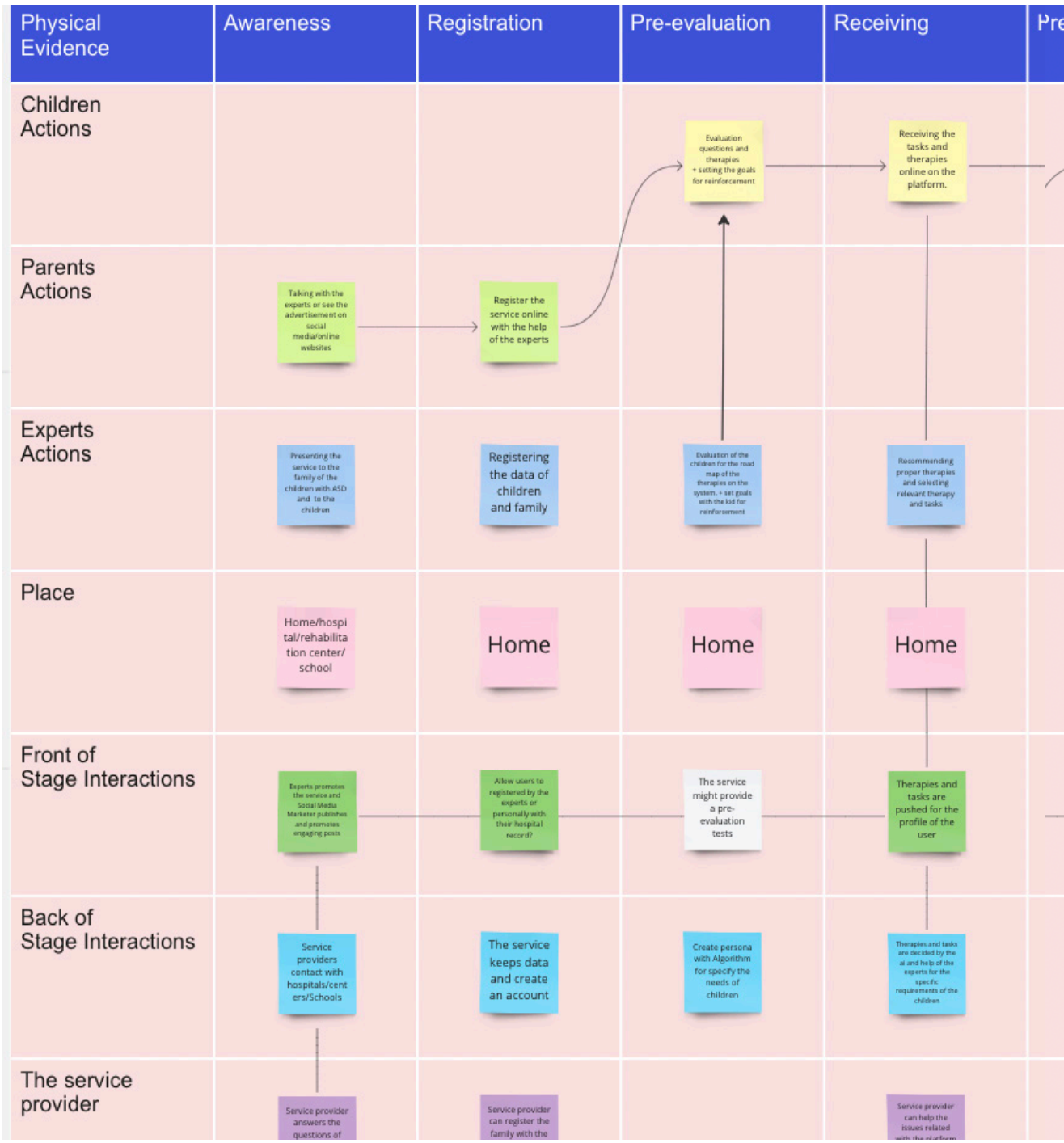
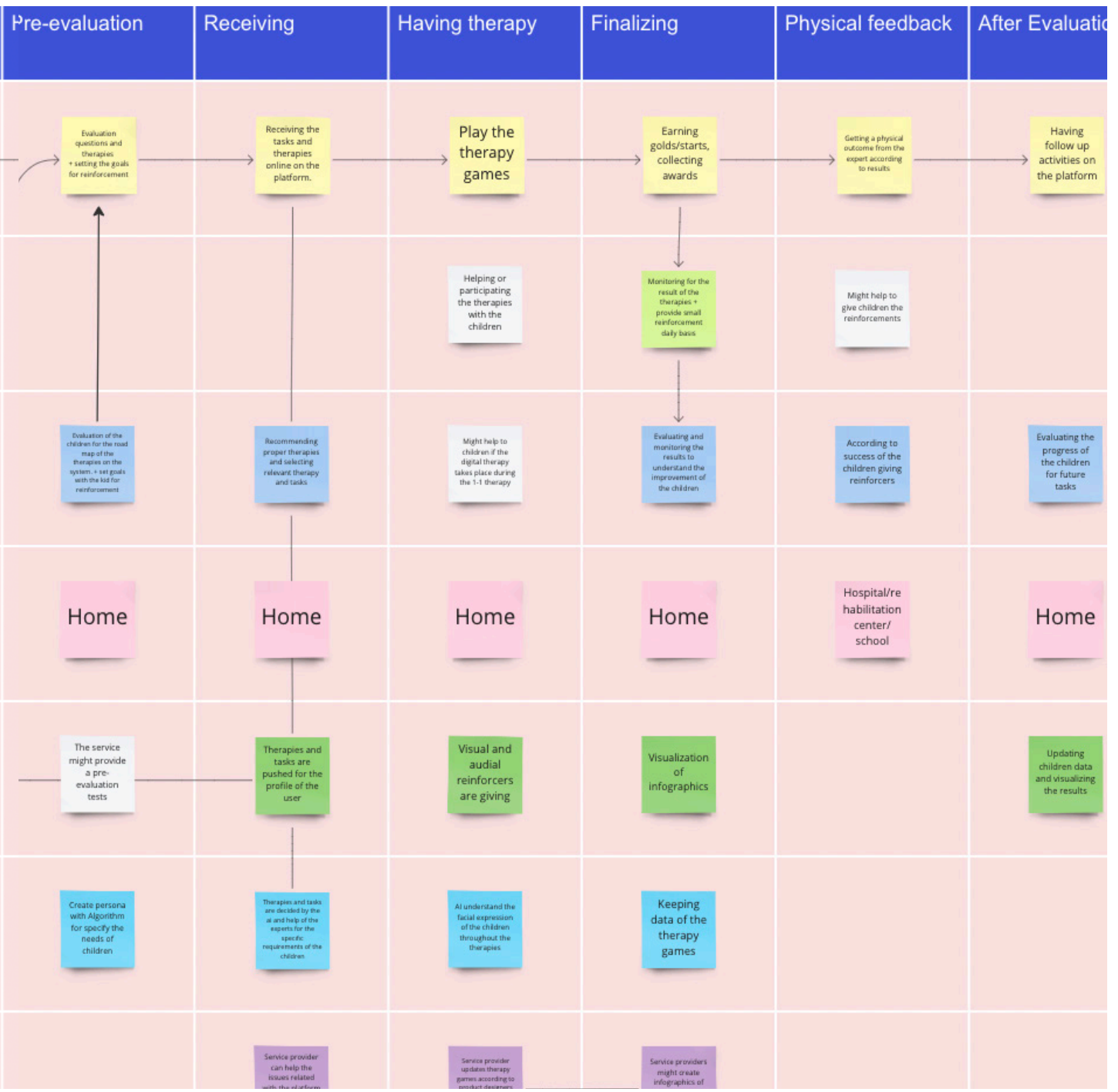


Figure 13


Pre-evaluation
Receiving
Having therapy
Finalizing
Physical feedback
After Evaluatic
Evaluation questions and therapies + setting the goals for reinforcement
Receiving the tasks and therapies online on the platform.
Play the therapy games
Earning golds/starts, collecting awards
Getting a physical outcome from the expert according to results
Having follow up activities on the platform
Helping or participating the therapies with the children
Monitoring for the result of the therapies + provide small reinforcement daily basis
Might help to give children the reinforcements
Evaluation of the children for the road map of the therapies on the system. + set goals with the kid for reinforcement
Recommending proper therapies and selecting relevant therapy and tasks
Might help to children if the digital therapy takes place during the 1-1 therapy
Evaluating and monitoring the results to understand the improvement of the children
According to success of the children giving reinforcers
Evaluating the progress of the children for future tasks
Home
Home
Home
Home
Hospital/rehabilitation center/ school
Home
The service might provide a pre-evaluation tests
Therapies and tasks are pushed for the profile of the user
Visual and audial reinforcers are giving
Visualization of infographics
Updating children data and visualizing the results
Create persona with Algorithm for specify the needs of children
Therapies and tasks are decided by the ai and help of the experts for the specific requirements of the children
AI understand the facial expression of the children throughout the therapies
Keeping data of the therapy games
Service provider can help the issues related
Service provider updates therapy games according to
Service providers might create infographics of

SERVICE SYSTEM MAP

In order to have broaden perspective how this system works along with the elements inside , I create a service system map which is a combination of a system amp and service map. A system map is a visual representation that displays all the entities involved in delivering a service and their interconnections, such as the exchange of materials, energy, information, money, and documents. It provides clarity on how the service components and roles connect and exchange values with each other (Morelli & Tollestrup, 2007b). Furthermore, a service map is a visual representation that depicts the process of delivering a service, the roles of both customers and employees, and the physical components of the service at the same time (Scheuing & Christopher, 1993b).

In this complete map (Figure 14), the service puts target user group which is children with Autism Spectrum Disorder. The children connect the system, are provided with digital therapy exercises by Auxilium, are monitored by the parents, and are evaluated by the experts. The other element of the service is Auxilium which provides data storage, cloud services for users. It gets profit from parents and the experts, and gets feedback from children and the experts. Besides, it provides therapy exercises for the children and visiual data of the development of the children to parents and experts with new suggestions on how to improve condition of the children. On the other hand, the parents use the service and subscribe to it. They are screening to development of the children and collaborating with the experts. The last main element of the service are the experts. They provide in person therapies for the children and they can observe them both in real life and digitally with the data provided by Auixlium. They use the information from the service to create sustainable therapy experience for the children while providing feedback for the service as well. Furthermore, they collaborate with parents to improve the children's conditions and to increase awareness of ASD while supporting well-being of the family. To sum up, each element of the system map cooperate the experience together to achieve optimum results for all of them.

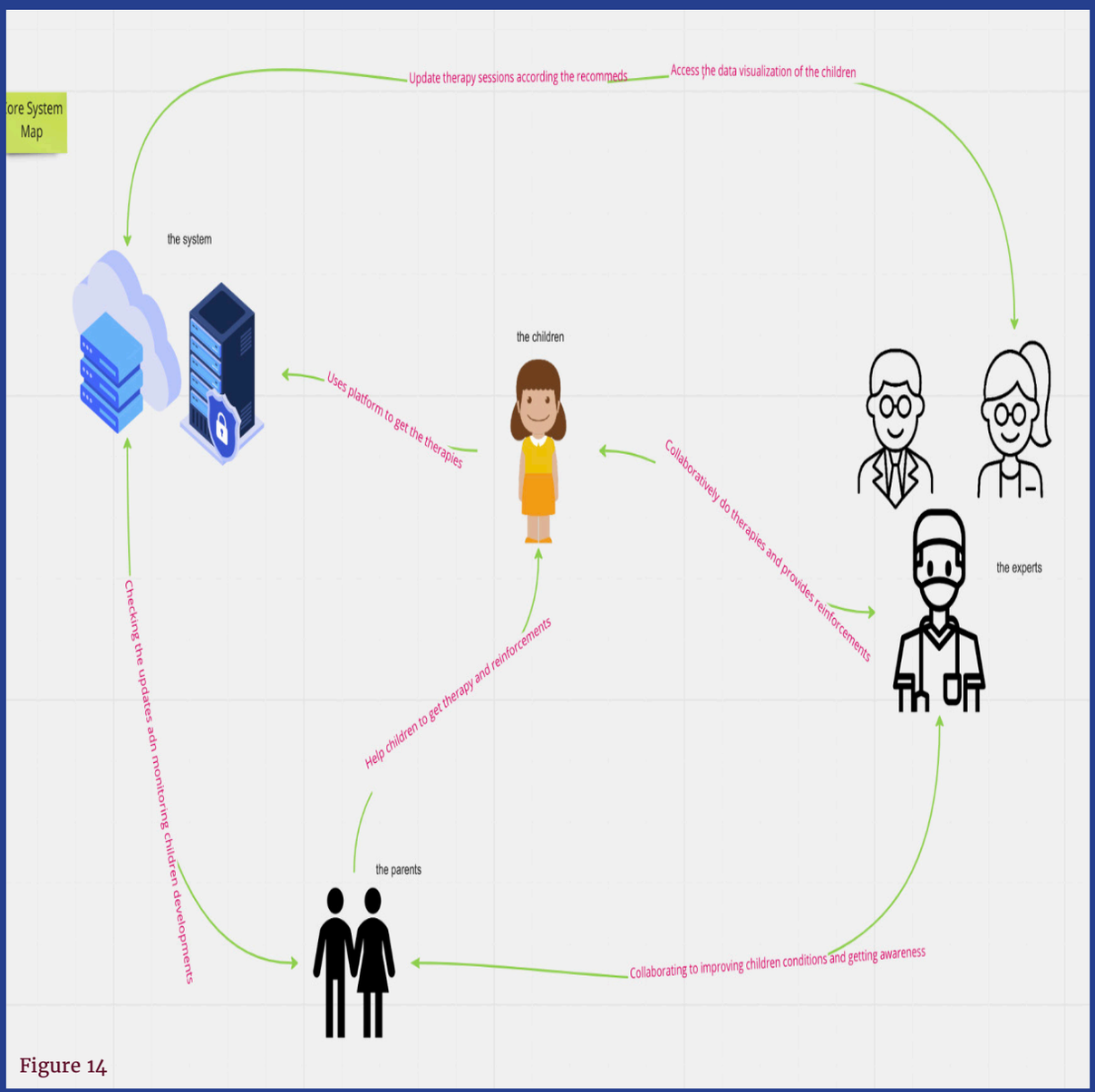

ore System Map
Update therapy sessions according the recommeds
Access the data visualization of the children
the system
the children
Uses platform to get the therapies
Collaboratively do therapies and provides reinforcements
the experts
Checking the updates adn monitoring children developments
Help children to get therapy and reinforcements
the parents
Collaborating to improving children conditions and getting awareness

Figure 14

INFORMATION ARCHITECTURE

Information architecture is a crucial document that serves as a roadmap for the functionality and actions of a product for users. It provides a comprehensive blueprint for digital products, displaying all pages, content, interactions, and behaviors in a clear and organized manner. This operational guide plays a critical role in ensuring that a product is designed and developed with the user's needs and expectations in mind, and it showcases the expertise and attention to detail of the team behind the product. In short, information architecture is an essential tool for creating successful digital products that meet user needs and deliver exceptional experiences (Pikover, 2018). Therefore, it is important to have a well-established IA to see the overall platform of Auxilium. Besides, Auxilium is aimed to reach its audience in multiple channels such as desktop, and mobile devices. Nevertheless, due to the time period of the research, I focus only on the desktop platform and its information architecture (Figure 15). The sections and subsections are labeled according to relativeness and aimed to decrease the cognitive load for the users. Direct and open dialog is the key to creating a better experience for children with ASD. Furthermore, using possessive adjectives and possessive pronouns show ownership. Thus, Auxilium has labels like "my activities" and "my profile" to create the feeling of belonging for the users while interacting with the platform.

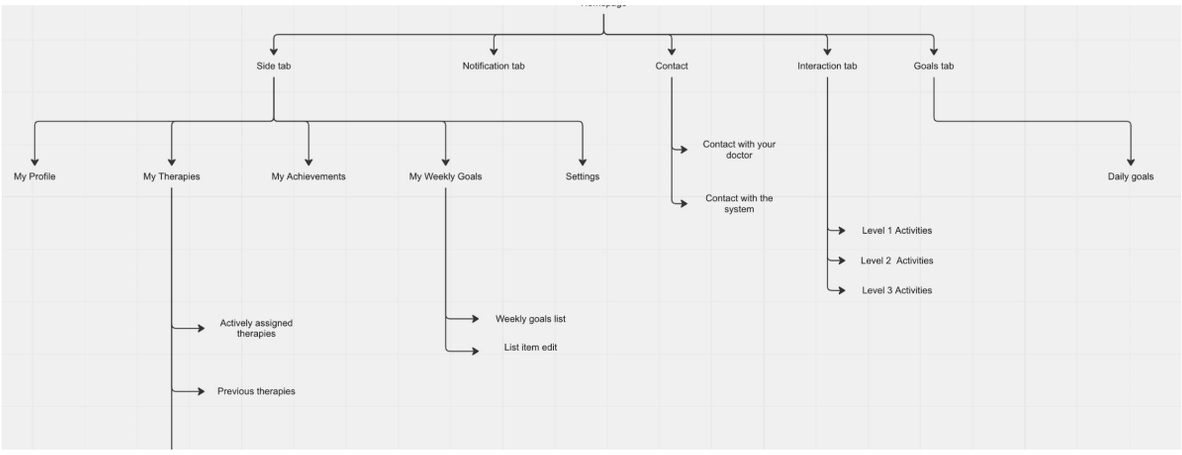


Figure 15

REINFORCEMENT MAP

The motivation source of Auxilium, for the children as users, is a token economy system. A token economy is a system based on contingency, where tokens are rewarded for displaying desirable behavior that can be exchanged for rewarding items or activities. Token economies are frequently employed in modifying behavior to increase positive actions and reduce the likelihood of negative actions (Cihon et al., 2019; Hackenberg, 2018). Furthermore, especially in the neurodevelopment disorder field, the token economy is one of the most common tools to create positive behavioral change (Matson & Boisjoli, 2009). Therefore, the Auixilum system includes positive reinforcement as stars to motivate children with ASD to demonstrate expected behavioral change. Auxilium works based on the goals of the children which are co-determined by the experts and the children. Moreover, they can set a goal for each day and a final big goal depending on the children's needs. Figure 16 shows how weekly and daily goals are formed. In order for the children to achieve their goals, they need to collect stars by exercising the therapy games regularly. Regardless of the difficulty level of the exercises, the children collect a star from each exercise. Then, these stars can be seen by the parents and the therapist. According to the agreement between the parents and the experts, the children can get their goals from either of them. Hence, the children feel more engaged and motivated while the parents/ experts create a stronger bond with them.

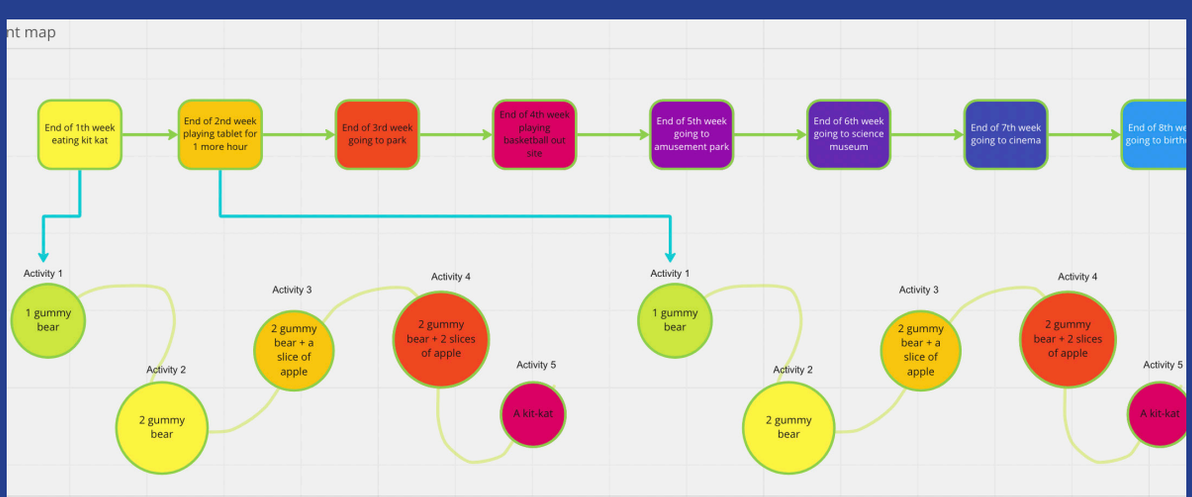


Figure 16

> *“The facial data of the children are stored in the database of Auxilium servers”*

GAMIFICATED THERAPY EXERCISES

Auxiulum offers a digital platform that functions as a product, aimed at helping children understand and express emotions effectively. This platform has different levels of gamification exercises, each designed to cater to the varied emotional needs of children. Each level has a curator/assistant which is an animated character to assist children with ASD to feel safer while interacting with digital screens. The curator of Auxilium is a character called Piggy. He helps the children by telling them what to do and as a storyteller along all levels.

Starting from the zero level, the service offers training on how to express emotions directly with the help of a mediator. At this level, children are asked to mirror their emotions on the screen and use their facial images to create their own database for future therapy exercises. This level is aimed at helping children identify and understand their emotions better, and then express them in a healthy and effective manner. In addition, the facial data of the children are stored in the database of Auxilium servers to help children to have better experiences for the next levels. Moving on to the first level, it provides direct emotional teaching, which involves basic emotional facial expressions and mimicking, and mirroring in contextual situations. This level is designed to help children learn how to recognize and express their emotions in a more natural and instinctive way. At this level, the children are shown pictures of different real-life contexts with people and asked how they feel to evaluate whether the children can create empathy with the people in the images. The second level is contextual emotional teaching, which involves emotional reactions to a certain scenario, focusing on one emotion. This level is aimed at helping children understand and express emotions in specific situations, thus helping them develop better coping mechanisms. At this level, the children are given video stories

— Story telling

that have context such as birthday parties, science classes, museums, etc. Then, they are given a situation where most people feel a certain emotion and are asked to express that specific emotion felt in the video. For instance, at a birthday party, most people feel happy when they eat birthday cake. This level usually focuses on one specific emotion. Finally, the third level is multi-emotional scenario teaching, which involves emotional reactions to a journey of scenarios, focusing on multiple emotions. This level is designed to help children understand and express multiple emotions in a single scenario, thus improving their emotional intelligence and resilience. At this level, the children are given video stories that have multiple contexts such as birthday parties, school trips, going to the theatre, etc. Then, they are given a sequence of situations where people can have different emotions and are asked to express those emotions felt in the video. Each emotion leads the children to a different storyline. For instance, at a birthday party, most people feel happy when they see a birthday cake but some people can also be surprised so there are two emotional ways to go with. According to the children's answers, the algorithm changes the storyline and makes the children experience all the possible emotions so that they can practice. This level usually focuses on multiple emotional developments.

In conclusion, Auxilium offers a comprehensive and effective way to help children understand and express emotions better. With different levels of games/therapies, children with ASD can experience a wider perspective of how people might feel and how they can show it.

INTERFACE DESIGN AND PROTOTYPE

The interface is the essential touchpoint of a service where users get their first impression. This touchpoint most of the time is perceived as whether the service is beneficial and usable or not. On that account, user interface design is a vital aspect of the systems. The interfaces that are meant to be used by people with Autism Spectrum Disorder, need to be accurate in terms of consistency among the whole platform, accessibility, usability, and cognitive (Pavlov, 2014). Therefore, UI elements must be designed according to the rules mentioned in the article of Pavlov. Based on that article, I make research about the copy size, font, colors, layout, and interaction methods. First of all, the copy needs to be as simple as possible to prevent any misunderstanding among children with ASD (Digital Synopsis, 2019). Hence, the titles of the sections are labeled in the "week+number+activity" style. As copy font style, Roboto is selected because it was created with the intention of being used primarily on digital screens where readability is significant. Its design considers the balance between the amount of content displayed and the ease of reading. It is compatible with modern browsers and can also function on older versions, ensuring optimal text display quality for all users (Typography – mygov.scot | Resources, n.d.). According to the rules Pavlov mentioned, the copy size ought to be a minimum of 14 pixels, in fact, I use 24 for text and for titles 28 which is even bigger than suggested. Furthermore, the minimum spacing between elements is 32 pixels which improves the visual balance between white space and the components (figure 17). In addition, the colors of the interfaces are mostly pastel colors which are based on Autism Friendly Colors. The reason why is the fact that the use of soft colors can create a sense of calmness that may lead individuals with autism to feel more relaxed (The Ultimate Guide to Autism Friendly Colours, 2021). The interface has three main colors which are light salmon pink (#FFAC9A), cookies and cream (#DEDDB1), and sea serpent (#50C1C7). Besides those colors, there is also sunglow (#FFC132) and antique bronze (#676519) for the text (figure 18). The distinctiveness of all colors enhances readability and dialog between the screen and the user. Moreover, regarding the interface, the general layout of the platform contains two main sections (figure 18). The first one is the user panel which has the image of the children, user profile, therapy exercises, achievements, goals, and settings.

The second section is the interactive area where exercises are displayed and interacted with. In this section, there is the option to contact Auxilium customer service assistants as well as the experts (figure 20). However, the experts can only be contacted via e-mail whereas, the assistant of the service is 7/24 available live. The ultimate aspect of the interface is the method of interaction with the platform. There are two main action methods which are mouse click and webcam. Most of the platform is navigated by clicking on the call to action buttons, nonetheless, the therapy exercises can be interacted with the webcam of the devices (figure 19). It is required by the platform due to the fact that the platform needs to recognize the face of the user to react.

In conclusion, designing a user interface for kids with Autism Spectrum Disorder requires a thoughtful and informed approach. By taking into account their unique needs and preferences, we, as designers, can create interfaces that are both functional and engaging. From incorporating visual cues to simplifying navigation, different methods have been used to create a positive user experience for children with ASD. By prioritizing user-centered design and working closely with experts in the field, I execute the interface on Figma and prototype it with help of Morpcast Studio. Ultimately, the goal is to create interfaces that empower children with ASD to communicate, learn, and grow emotionally in ways that are both stimulating and accessible.

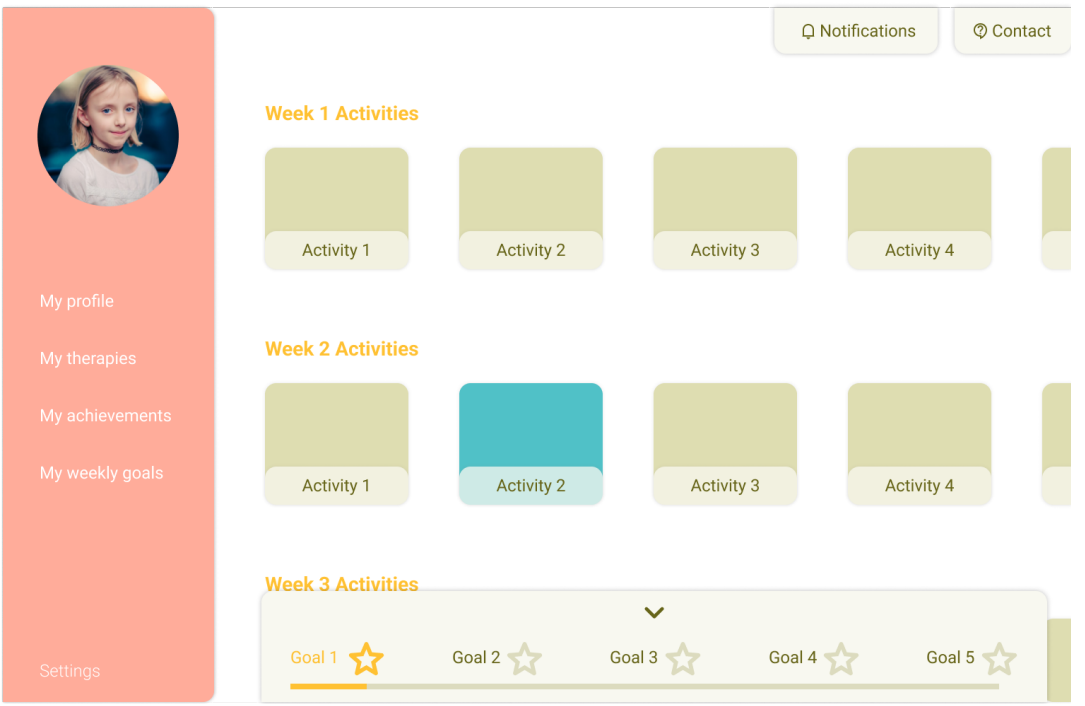


Figure 17

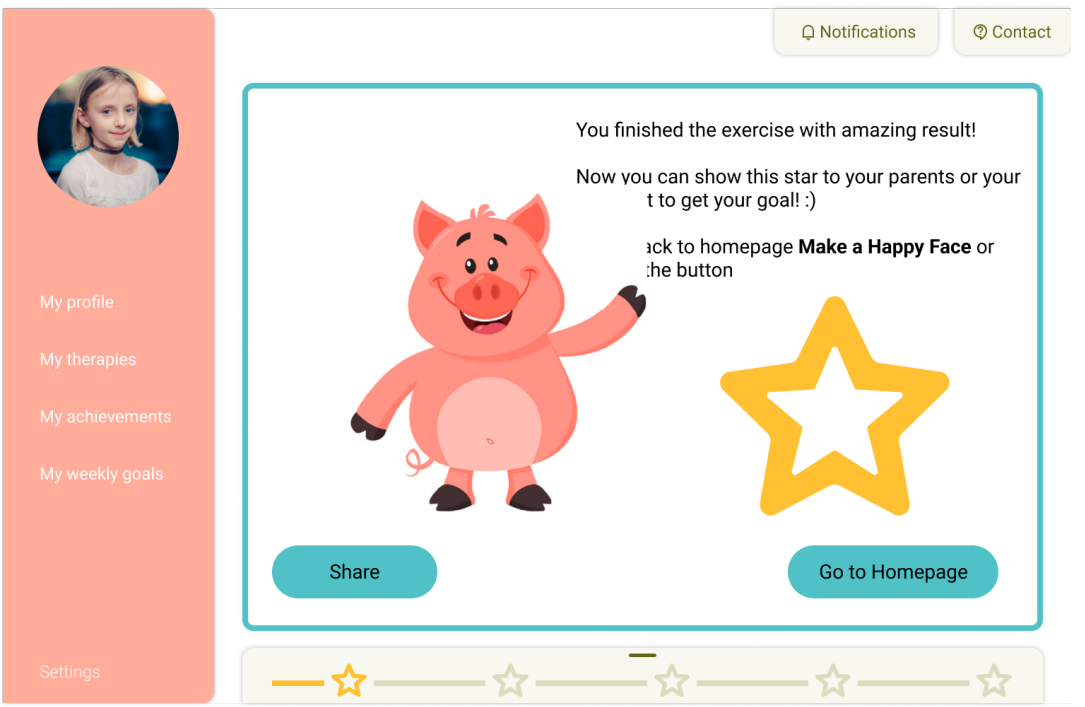


Figure 18

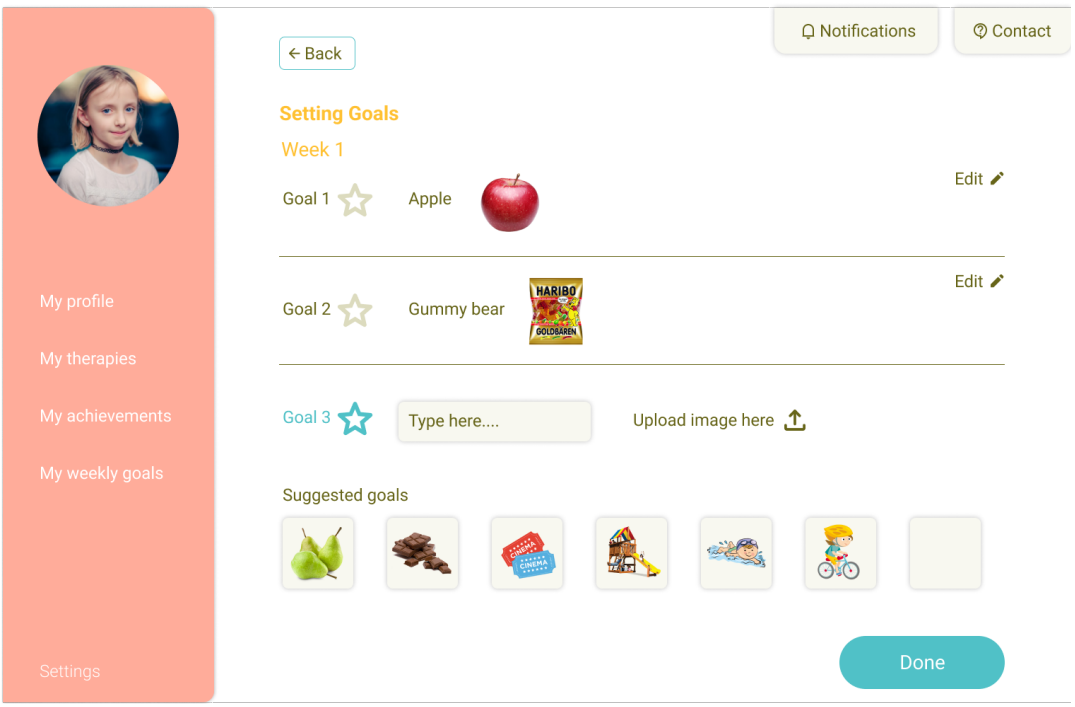


Figure 19

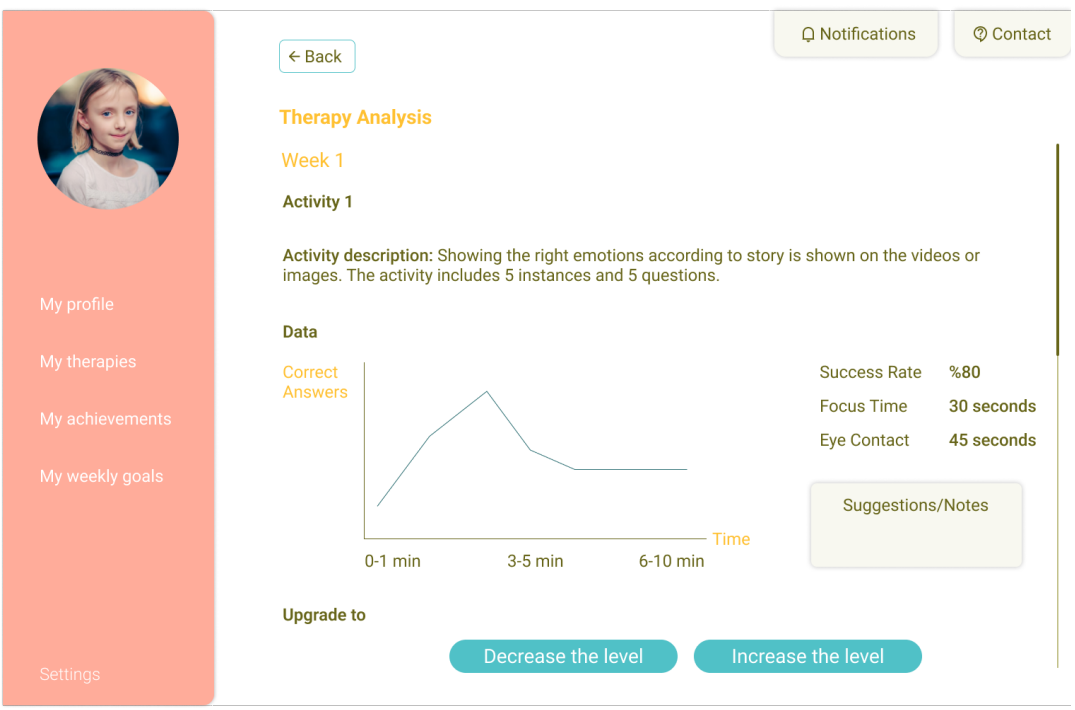


Figure 20

Methods

Contents

DESIGN RESEARCH METHODS

Design Methods

RESEARCH

Design methods refer to the systematic approach used by design researchers to solve complex problems and create effective solutions. These methods involve a range of techniques, tools, and processes that enable designers to understand user needs, ideate potential solutions, and iteratively refine their designs until they meet the desired outcome. Design methods can be applied across various domains, including product design, service design, and user experience design, among others. By leveraging design methods, the researchers can create innovative and impactful designs that not only meet user needs but also align with social impact objectives, resulting in designs that are not only aesthetically pleasing but also functionally effective and socially responsible. In this chapter, I will provide an overview of how I approach my research question and describe the methods I use to answer it. By sharing my process and techniques, I hope to provide insights and guidance for other designers looking to improve their design practices and create more impactful designs.

> *“Developing a product that is tailored to meet the needs of children with ASD.”*

DESIGN RESEARCH METHODS

In order to gain a comprehensive understanding of the current state of ASD conditions, I conducted initial generative interviews with both parents of children with ASD and therapists. These interviews involved speaking with one parent from Antalya and two therapists, one based in Istanbul and the other in Milan. I purposefully chose individuals with whom I had existing connections in order to ensure sensitive and intimate conversations could be conducted with ease. Following these initial insights, I began to develop the platform and service idea, creating mock-ups and conducting user testing and concept evaluation.

After receiving feedback from the therapists, I revised the mock-ups accordingly and began to plan a real user testing session. Unfortunately, I was unable to obtain consent from the rehabilitation center to conduct user testing with children with ASD, so I instead conducted testing with therapists.

The user testing session involved mock-up trials and interviews, with both qualitative and quantitative questions. I conducted a total of five interviews, four of which were in-person and one was conducted online. All five therapists were based in Milan and worked in rehabilitation centers. Based on the feedback received, I made revisions to the product and included the final version in the last chapter of my thesis. Overall, this process involved significant attention to detail and a high level of expertise in order to ensure the most accurate and valuable insights were obtained.The insights gained from user testing with therapists were invaluable in refining and improving the platform and service idea. The feedback received allowed me to identify key areas for improvement and make necessary changes to create a more effective and user-friendly product.

It is important to note that while user testing

User centered

with children with ASD would have provided more direct insights, conducting testing with therapists allowed me to gain a unique perspective from professionals who work closely with children with ASD on a daily basis. This perspective allowed me to better understand the needs and challenges faced by children with ASD and develop a product that is tailored to meet those needs. Overall, the user testing process was a critical step in the development of the platform and service idea. Without this process, it would have been difficult to identify and address key areas for improvement and create a product that is truly effective in supporting children with ASD and their families. As a researcher and designer, I am committed to taking a comprehensive and thorough approach to ensure that my work is of the highest quality and provides the greatest value to those it is intended to serve.

Results

Contents

INSIGHTS ABOUT EFFECTIVENESS

INSIGHTS ABOUT USABILITY

Results

After all the effort I put into user testing, I was rewarded with a wealth of insightful and interesting results. These results can be categorized into two main sections: the platform's effectiveness and its usability. To evaluate the effectiveness of the platform, I conducted qualitative questionnaires that focused on user feedback and opinions. The users were asked to provide their thoughts on the platform's ability to meet their needs and provide solutions to their problems. The responses provided a deep understanding of how well the platform was able to address the pain points of its target audience. In addition to the qualitative questionnaires, I also conducted quantitative questionnaires to evaluate the usability of the Auxilium platform as a whole. These surveys were designed to assess the ease of use of the platform, including the navigation, layout, and design. The results of the surveys provided a clear understanding of the platform's strengths and weaknesses and helped to identify areas for improvement. In this chapter, I analyze the result data from the user testings.

> *“Offering options to choose from can increse feeling more in control of the progress.”*

INSIGHTS ABOUT EFFECTIVENESS

All the while first part of the user testing which is more about effectiveness of Auxilium, the majority of participants agreed that the platform is overall beneficial for children with ASD, nonetheless, they also noted that it should be used as a supplementary exercise to real therapies. One significant insight from the interviews was that the platform can enhance the customization of exercises according to each child’s unique needs. This is important because each child is in a different position in the autism spectrum, and analyzing their current situation can improve the process of creating a customized exercise plan. Another important aspect of the platform is the onboarding process for parents and children since it is a new style of supplementary exercise. A clear and simple onboarding process is crucial for its success. The exercise periods and parenting control also play a vital role in the success of the platform. One participant pointed out that some parents can get overly competitive and force their children to do more exercises than originally assigned, which can create frustration. On the other hand, if the children do not want to do the assigned exercises, it is important for the therapist to know so that the result data is not affected for the next week. Lastly, I received comments regarding the token economy topic and set goals. Participants suggested that the number of goals for each activity should be limited to two, to avoid overwhelming children with too many tasks. This way, children can feel more integrated and free, which can help them feel more motivated. Additionally, offering options for children to choose from can help them feel more in control of their own progress.

Overall, our evaluation of the platform for children with ASD revealed some valuable insights. The platform is beneficial for children with ASD and can enhance the customization of exercises based

— Preventing abusive use

on each child's unique needs. A clear and simple onboarding process is crucial, and exercise periods and parenting control play a vital role in the platform's success. Finally, the number of goals for each activity should be limited to two, and offering options for children to choose from can help them feel more motivated. By taking these insights into consideration, I can continue to improve Auxilium and it can become an essential tool in the therapy process for children with ASD, helping them to overcome some of the challenges they face and improve their quality of life.

> *“Basic illustrations might enhace the experience for the kids with low-func. ASD.”*

INSIGHTS ABOUT USABILITY

In the second half of the user testing sessions, I conducted user interviews to evaluate the usability and interface of Auxilium. The participants in the testing agreed that the program’s use of colors, font sizes, and icons was appropriate for children with ASD. They also recommended a multi-interaction style that includes manual and facial controls, which can be beneficial. However, during the testing, three main usability issues were highlighted by the participants. The first issue is the method of interaction. The program relies on a mouse click or touch on the tablet, although it expects children to show facial expressions during exercises. Facial recognition depends on several variables such as the type of computer, camera quality, interior lighting, and speed of the internet, which can affect the quality of the exercise experience. When everything works as expected, the experience is good, but when it doesn’t, it can create frustration for the child. The second issue is the images used to represent the goals of the children. During my research, I found that using real-life images, such as a child’s favorite food or activity, provides better communication when setting goals for the week for children with ASD. The participants even suggested using real-life images of the child herself/himself to represent an activity, such as riding a bike with a picture of the child’s own bike. The third and final issue is the level of detail in the graphics. While the program’s level of detail looked appropriate for children with high-functioning ASD, the participants recommended using fewer visuals for other types of ASD to help them focus on specific subjects without distraction. They noted that children with ASD tend to feel more comfortable with less visual stimulation on the screen. Therefore, depending on the severity level, the illustrations of Auxilium need to be flexible.

— Webcam interaction

Overall, the user research showed that Auxilium has the potential for helping children with ASD to develop their communication and social skills. However, it is crucial to consider the usability issues which are identified to improve the program's effectiveness. The participants agreed on implementing a multi-interaction style that includes manual and facial controls, using real-life images to represent goals, and adjusting the level of detail in graphics based on the specific needs of children with ASD. By addressing these issues, I can create a more effective and user-friendly service that does not stress out the children.

Discussion

Contents

THE GAPS IN AUXILIUM

RECOVERING FROM MISTAKES

IMPROVEMENT POINTS OF AUXILIUM

Discussion

Discussion is a crucial aspect of research, as it provides an opportunity for the author to reflect on the implications of their research and the impact it could have on the design of services. The discussion section allows the researcher to critically analyze the findings of their research, evaluate the success of the service design process, and identify areas for improvement. It is a space for the researcher to reflect on the effectiveness of the service design methods used, and to explore the potential impact of the findings on the end-users of the service. Through this section, I draw conclusions about the effectiveness of the service design approach used and provide recommendations for future service design projects. In this chapter, I will analyze the key findings of the service design process, evaluate their implications for the design of services, and reflect on the research questions and hypotheses, as well as I highlight the gaps and improvement points for Axuilium thereby contributing to the advancement of knowledge in the field of service design.

> *“Developing a product that is tailored to meet the needs of children with ASD.”*

THE GAPS IN AUXILIUM

During my search research, I have identified more than one significant gaps, nonetheless, I was amazed by the idea of supporting the emotional development of children with Autism Spectrum Disorder (ASD) and their social skills. Although a lot of time and effort have been invested in designing for autism, there are still open points in the digital aspect of the services and experiences for children with ASD regarding emotional education. This realization led to the creation of the Auxilium project, which aims to evaluate the problem and create a much-needed solution for it.

After six months of project development and user testing, Axuilium is an overall well-thought service, however, still has areas of improvements. The improvement points can be broadly categorized into two main parts, which are the service experience and user interaction. In the service experience aspect, each stakeholder has different issues that need to be solved separately. Therapists, for instance, are concerned about parents who can get overly competitive and force their children to do more exercises than originally assigned. This situation creates frustration and, at times, can lead to parents becoming abusive towards Auxilium. To address this issue, full control of the platform needs to be given to the therapist. This means that parents should only be able to screen the results and contact the therapist if necessary. Additionally, if a child is unwilling to do the assigned exercises, it is important for the therapist to know so that the results are not affected for the next week. Therefore, we recommend adding direct notes or communication tools between parents and therapists to evaluate the current situation of thechildren.

On the other hand, users have also raised concerns about the interface and usability of the platform. Some children with ASD may not be able to navigate the platform effectively due to their limited

User centered

attention span and sensory sensitivity. Therefore, the platform needs to have a user-friendly interface with clear instructions and simplified graphics that are easy to understand. Additionally, incorporating sensory-friendly design elements can enhance the user experience and make the platform more accessible to children with ASD.

In conclusion, addressing the gap in digital supplementary exercises that support emotional growth and development for children with ASD requires a comprehensive approach that considers the needs and missusage of all stakeholders. Auxilium can address these issues and continue to work towards creating a platform that is accessible, user-friendly, and effective in supporting the social and individual improvement of children with ASD.

> *“Basic illustrations might enhace the experience for the kids with low-func. ASD.”*

RECOVERING FROM MISTAKES

In every service or system, the aim is to create a flawless experience for the users without problems. Nonetheless, most of the time, some complications occur during usage. Therefore, another vital feature of a system become error recovery. This feature determines how broadly the service is designed and envisioned. Furthermore, the errors can be related to different sources such as hardware, and software. Most of the time hardware errors require external help at a high cost, on the contrary, software errors can be solved relatively easily. Hence, Auxilium ought to assist the children if there is any error regarding the environment or software-wise. For the errors that are related to exercises and interaction, it is suggested to have a voice assistant as well as functioning call-to-action buttons. In order not to frustrate the children one participant suggested using clear instructions to tell what is not working in the system currently. For instance, if the camera cannot recognize the face of the children, the verbal assistant should warn the children to tilt the camera or change their position. This verbal warning will also be on the screen as visual feedback to the children.

Consequently, having multiple interaction methods such as click, swipe, or camera, and having a verbal and visual assistant to help with what is going on wrong are two main approaches to recovering from errors. These approaches can enhance the overall experience for the target user group which is children with Autism Spectrum Disorder.

IMPROVEMENT POINTS OF AUXILIUM

During the research phase, I have identified two significant aspect for improvement which are user interaction and cognitive load. The first aspect concerns the necessity to include an advanced situational warning system that can assess whether all necessary variables are correctly set up before the exercise begins. The accuracy of facial recognition depends on several factors, such as computer type, camera quality, interior lighting, and internet speed. By incorporating warning notifications, children can ensure that each variable is correctly configured before commencing the exercise, which can enhance their confidence while using the service and alleviate their worries about failure. Furthermore, the inclusion of an advanced situational warning system can increase the reliability of the service and enhance the user experience. By detecting potential issues in advance, the system can reduce the likelihood of technical problems arising during the exercise, which can help to establish a positive perception of the platform among users.

The second area for improvement concerns reducing the visual cognitive load for children with ASD. The images and illustrations used in the exercises play a critical role in the readability and comprehensibility of the activity sessions. Children with ASD often struggle to process complex visual information, which can cause frustration and lead to disengagement from the activity. Therefore, the platform should offer different graphics based on the level of ASD to establish better communication with the users. For instance, using only faces or emojis could be an effective solution for children with low-functioning autism, as it can simplify the information and reduce the cognitive load. In addition to reducing cognitive load, the platform can enhance user engagement and motivation by providing personalized graphics that align with each child's preferences and interests. By tailoring the graphics to the child's individual needs, the platform can establish a stronger connection with the user and promote long-term engagement with the service.

In conclusion, the incorporation of an advanced situational warning system and personalized graphics can significantly improve the user experience of Auxilium for children with ASD. By prioritizing user needs and preferences, Auxilium can establish itself as a leading platform for supporting children with ASD in their emotional developmental journey

Conclusion

Contents

UNDER THE SPOT LIGHT: CONSEQUENCES OF THE RESEARCH

BROADEN THE FUTURE HORIZONS

Conclusion

As I come to the end of this work, I am reflecting on the key points and takeaways that I have presented. Throughout my study, I have explored the relationship between digital interactions and the emotional development of children with high-functioning Autism Spectrum Disorder and examined how might we support emotional development and emotional expression for 5-7 years old kids with ASD. My findings have shed light on improving emotional expressions and have contributed to the current understanding of digital interaction for therapy purposes. In this final chapter, I summarize the major findings and draw conclusions about their implications for digital design for people with ASD. Additionally, I will consider the limitations of my study and identify areas for future research. Finally, I will discuss the broader implications of my work and how it may impact all stakeholders such as the families, the experts/therapists, rehabilitation centers, schools etc.

UNDER THE SPOT LIGHT: CONSEQUENCES OF THE RESEARCH

After conducting a thorough quantitative and qualitative analysis of user testing and revisions, I developed an upgraded version of the platform that aims to provide effective solutions to users' questions. The platform, Auxilium, focuses on enhancing emotional development and improving self-expression in verbal communication for children with Autism Spectrum Disorder (ASD), while also using gamification to make therapy exercises less frustrating.Throughout my research, I discovered that Auxilium can significantly improve the emotional development and self-expression in verbal communication of children with ASD. By providing a wide range of real-life examples of emotional contexts that children with ASD may experience, the service helps these children better understand people and improve their empathy skills. Experts, therapists, and parents have all attested to the effectiveness of Auxilium, which provides a great deal of hope for children with ASD and their families.

However, it is important to note that while digitalized games and exercises can support the emotional development of children with ASD, a holistic approach is necessary to build better communication among all stakeholders. By taking a holistic approach, we can ensure that customized exercises are designed to meet the specific needs of each child, and parents and therapists can monitor progress and make adjustments as necessary. The service should also provide valuable information for the children, parents, and therapists to create a well-informed and collaborative network.

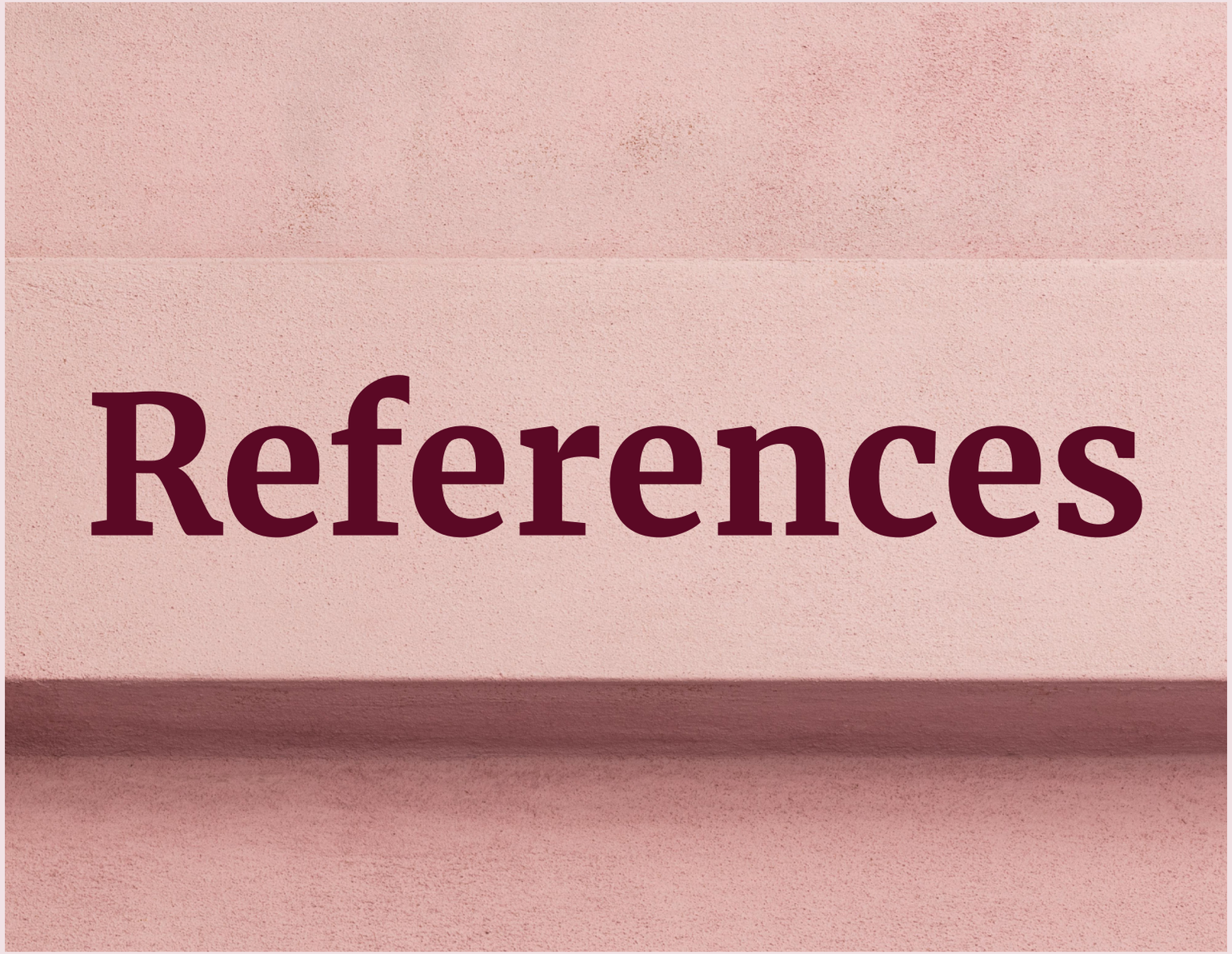
In addition to improving emotional development, Auxilium can also aid in the development of other skills, such as speech and educational learning. Therefore, my research emphasizes the importance of a comprehensive approach to emotional development in children with ASD and highlights the potential benefits of Auxilium for not only children, but also their parents and therapists. By fostering a strong network and communication among all stakeholders, we can create a better future for children with ASD.

BROADEN THE FUTURE HORIZONS

To ensure that future research yields accurate and reliable results, it is highly recommended to conduct real-world user testing and trials of different levels of exercise. Such testing can provide valuable insight into how different types and levels of physical activity affect the emotional development of children with autism spectrum disorder (ASD). Additionally, experts in the field of therapy have suggested that facial recognition exercises can be beneficial for helping individuals with ASD better understand and express emotions. Nevertheless, it is important to note that further research is needed to determine the impact of using screens and cameras on the emotional development of children with ASD. Specifically, it is necessary to investigate whether the use of technology might potentially isolate children from real-life social contexts or create a disassociation from their emotions.

The current study indicates that addressing the emotional development of children with ASD requires a comprehensive approach that blends physical and digital therapy exercises along with human contact with parents and therapists. This approach could potentially enhance the social skills of these children, and it could be implemented as part of a service offering by Auxilium. Nonetheless, it is crucial to conduct deeper research in order to fully understand the unique needs of children with ASD and to ensure that any potential service offering meets those needs.

Consequently, this study serves as a foundation for a digital therapy service designed to promote emotional development, while future research could explore and provide diverse types of therapies and exercises following a similar approach. By taking a holistic approach to the emotional development of children with ASD, it is possible to create effective and meaningful interventions that help these children thrive.



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Appendix

Contents

INITIAL USER INTERVIEWS

AUXILIUM INTERFACE SCREENS

USER TESTING INTERVIEWS

INITIAL USER INTERVIEWS

Lord, C., Elsabbagh, M., Baird, G., & Veenstra-Vanderweele, J. (2018).Autism spectrum disorder. The Lancet,392(10146), 508–520.

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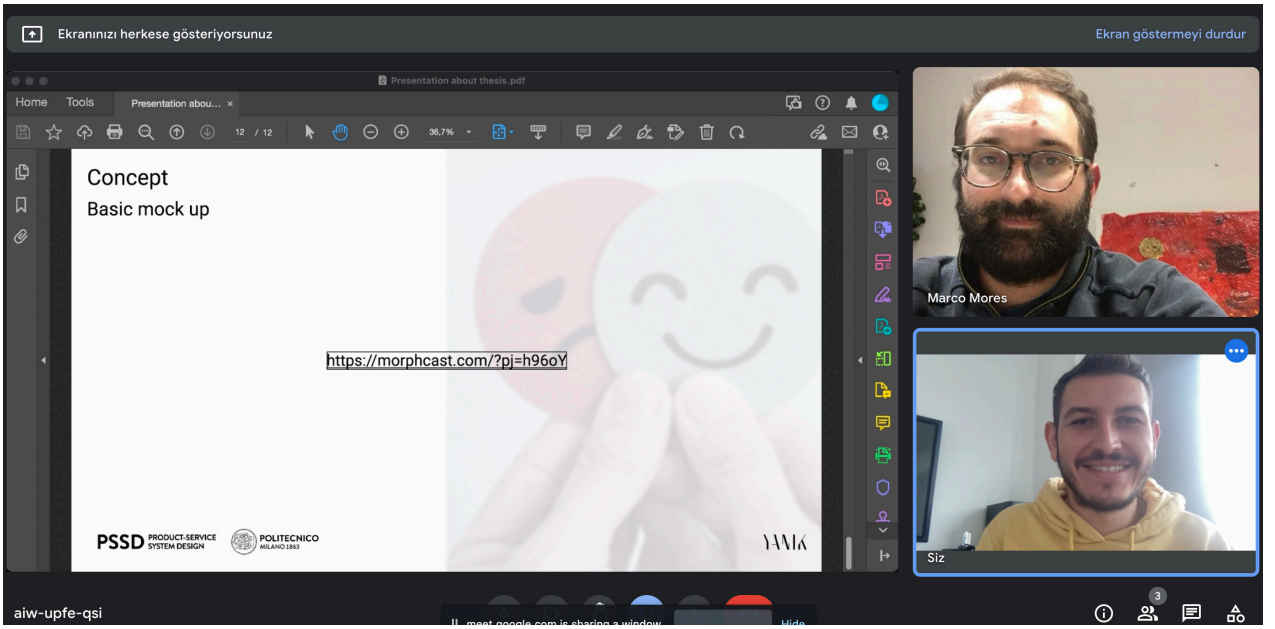
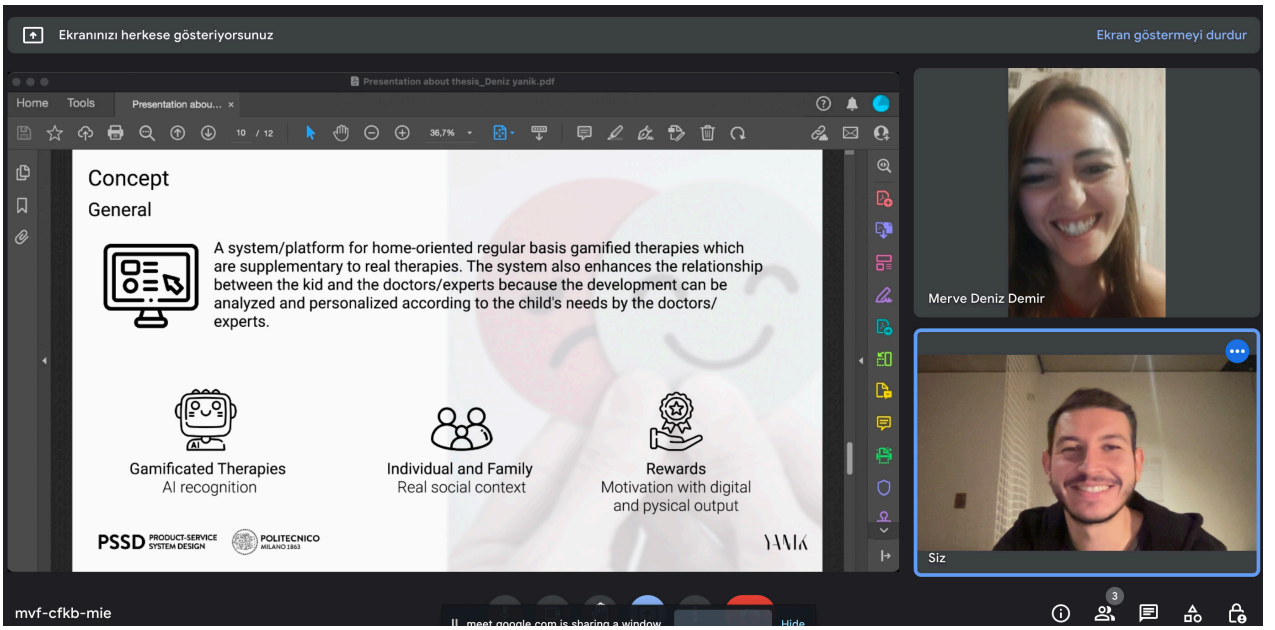
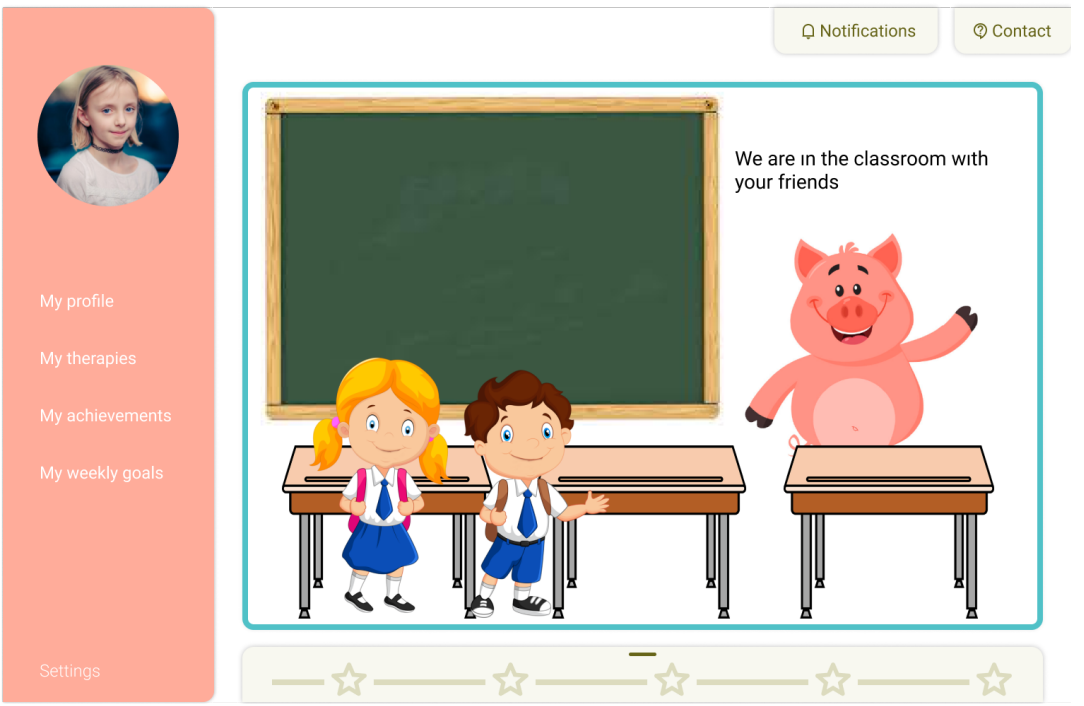
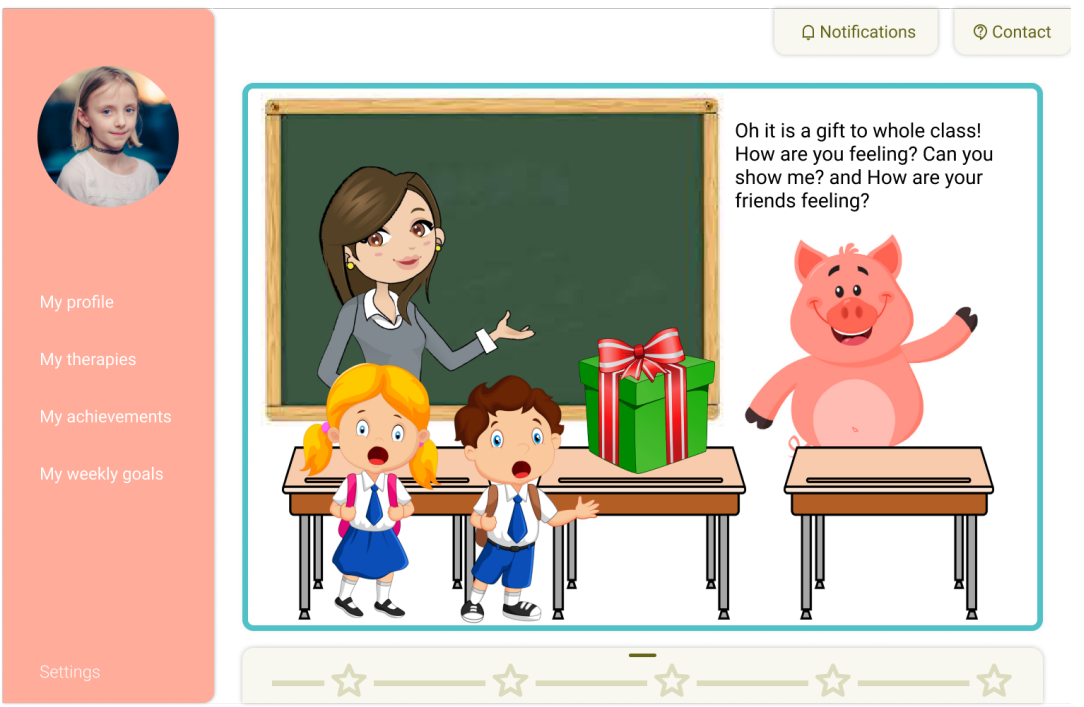
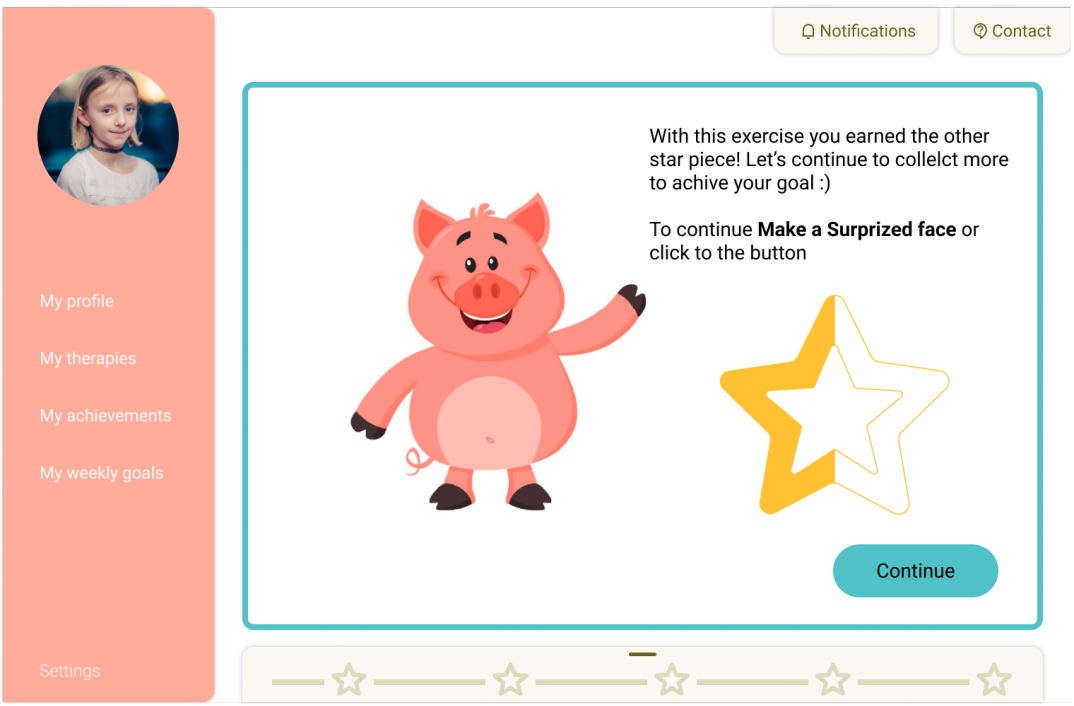

Ekranınızı herkese gösteriyorsunuz
Ekran göstermeyi durdur
Concept
Basic mock up
https://morphcast.com/?pj=h96oY
PSSD
Marco Mores
Siz
aiw-upfe-qsi

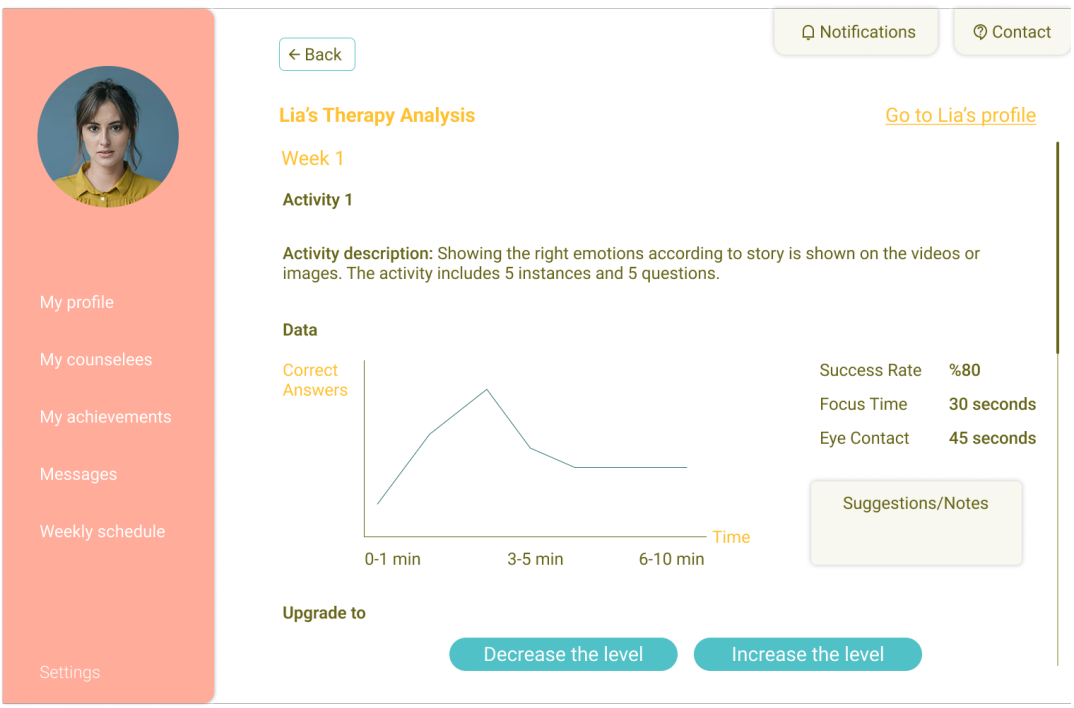

Ekranınızı herkese gösteriyorsunuz
Ekran göstermeyi durdur
Concept
General
A system/platform for home-oriented regular basis gamified therapies which are supplementary to real therapies. The system also enhances the relationship between the kid and the doctors/experts because the development can be analyzed and personalized according to the child's needs by the doctors/ experts.
Gamificated Therapies
AI recognition
Individual and Family
Real social context
Rewards
Motivation with digital and pysical output
PSSD
Merve Deniz Demir
Siz
mvf-cfkb-mie

AUXILIUM INTERFACE SCREENS






Notifications
Contact
My profile
My therapies
My achievements
My weekly goals
Settings
With this exercise you earned the other star piece! Let's continue to collelct more to achive your goal :)
To continue **Make a Surprized face** or click to the button
Continue


Notifications
Contact
← Back
My profile
My counselees
My achievements
Messages
Weekly schedule
Settings
Lia's Therapy Analysis
Go to Lia's profile
Week 1
Activity 1
Activity description: Showing the right emotions according to story is shown on the videos or images. The activity includes 5 instances and 5 questions.
Data
Correct Answers
Time
0-1 min
3-5 min
6-10 min
Success Rate %80
Focus Time 30 seconds
Eye Contact 45 seconds
Suggestions/Notes
Upgrade to
Decrease the level
Increase the level

USER TESTING INTERVIEWS

In the user testing I have created a questionnaire and concent form.

Personal information

Name:
Surname:
Age:
Occupation:
Location:
Work Experience:
Specialty:

Section 1 (Qualitative)

1)What is the most positive about the service?

2)What is the most negative about the service? How it can be improved?

3)What do you think that the service can be beneficial for?

4)Can service improve the therapy experience? In what ways do you think?

5)Would you consider to use this service in your therapy sessions?

6)Do you use any other digital supporters for your therapies?

Section 2 (Quantitative)

1)Is it easy to use for a child within ASD? Can you explain why?

2)The labels are enough clear to understand? How it can be improved?

3)The sequence is good? What are the improvement points for you?

4)Can you differentiate the colors? What do you think about the color visibility, stimuli etc?

5)Are the copy (texts) are understandable?

5)How many steps you take to reach the exercises? What do you think about it?

6)Can you describe what is the best interaction and what is the worst? Why?

PSSD PRODUCT-SERVICE SYSTEM DESIGN POLITECNICO MILANO 1863 YANIK

User Testing Consent Form

This form is prepared by Deniz Yanik to contribute his thesis about Digital AI integration in therapies for the children within ASD. This form ensures the general data protection regulations (GDPR) are applied while study is carried. This template is designed primarily for those doing qualitative interviews and user testing of the service with experts, therapists, teachers, doctors who are working in the field of Autism Spectrum Disorder therapies.

Study Details

The purpose of this study is for us to better understand the user experience of my service and digital product concept. Your participation in this study will help us modify, develop, or otherwise improve my services. This study will consist of a 1-on-1 interview and user testing in person.

Data I Will Collect

I will ask you questions about your use of our products and services. I will record the session and I will take notes to record your comments as well as photos. I will not request, and you should not provide, any sensitive personal information in this study.

How We Will Use Your Data

Any data, recording or other personal information collected about you will be treated confidentially. I may use recordings and notes for internal purposes as I continue to improve the service concept. I may also anonymize your responses and aggregate them with the responses of other participants in order to share study results externally.

Your Rights

Your participation in this study is voluntary. You can take a break or discontinue participation at any time without giving a reason. If you have any questions or concerns about this study or if you wish to withdraw your consent in the future, please email “deniz.yanik@mail.polimi.it”

Your Consent

1. I…… voluntarily agree to participate in this research study.
2. I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
3. I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
4. I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
5. I understand that participation involves…[outline briefly in simple terms what participation in your research will involve].
6. I understand that I will not benefit directly from participating in this research.
7. I agree to my interview being audio-recorded.
8. I understand that all information I provide for this study will be treated confidentially.
9. I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
10. I understand that disguised extracts from my interview may be quoted in…[list all forum in which you plan to use the data from the interview: dissertation, conference presentation, published papers etc.].
11. I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.
12. I understand that signed consent forms and original audio recordings will be retained in [specify location, security arrangements and who has access to data] until [specific relevant period – for students this will be until the exam board confirms the results of their dissertation].
13. I understand that a transcript of my interview in which all identifying information has been removed will be retained for [specific relevant period – for students this will be two years from the date of the exam board].
14. I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.
15. I understand that I am free to contact any of the people involved in the research to seek further clarification and information.Names, degrees, affiliations and contact details of researchers (and academic supervisors when relevant).

Signature of research participant

I believe the researcher informed me about consent to participate in this study.

Signature of participant Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study.

Signature of researcher Date

USER TESTING INTERVIEWS

PARTICIPANT 1

In the user testing I have created a questionnaire and concent form.

Name = Marco
Surname = Marnes
Age = 32
Occupation = Project manager
Location = Milan Child rehabilitator
Years of experience = 10 years
Specialty = Sereblampersi
Autism
childhood disabilities

Section 1

- How are therapies done
-

Section 2

- User testing (Phantom interface on help)

1) for no yes
for the yes
2) bigger labels
3) not immediate contact with therapies weekly reports

→ concrete, graphic visuals
→ reactive of real thing
real images

equal minute 1 2 3 4

→ also wrong answers
what went wrong

→ Colors looks okay
→ parents and kids can only do therapy

Therapist can adjust what to do how much to do

parent → focus on performance
focus on emotion

b) play activity
mostly physical
Don't use digital tool
relationship physical

f) No, homework
Talk with parents
common ways they do more

Section 3

Open ended feed back

1) interaction is quite good
if child is asked expression
look screen not camera
intuitive

Task 1 → *
Task 2 → * full stair doing good

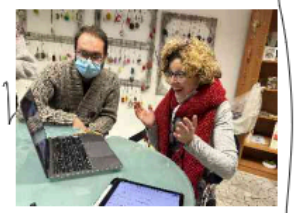
USER TESTING INTERVIEWS

PARTICIPANT 2

In the user testing I have created a questionnaire and concent form.

Name = Carmela
Surname = Alberti
Age = 49
Occupation = Project manager
Location = Milan
Years of experience = 20
Specialty =

Physiotherapist
FEUERSTEIN method



Section 1

- How are therapies done
-

1) for no yes
for the yes
2) bigger labels
3) not immediate contact with therapies
weekly reports

→ concrete graphic visuals
→ picture of real thing
real images

equal minute

b) play activity
mostly physical
Don't use digital tool
relationship physical)

adults, any interface can help

Section 2

- User testing (pretending ans kid)

Pointer → what you are doing

→ showing the where are you
what are you doing

Talk with parents
common ways they dance

1) interaction is quite good

if child is asked
facial expression
look screen not camera

→ also bring answers
what went wrong

→ Colors looks okay
→

parents and kids can't only do therapy

Therapist can adjust
what to do
how much to do

Section 3

Open ended feedback

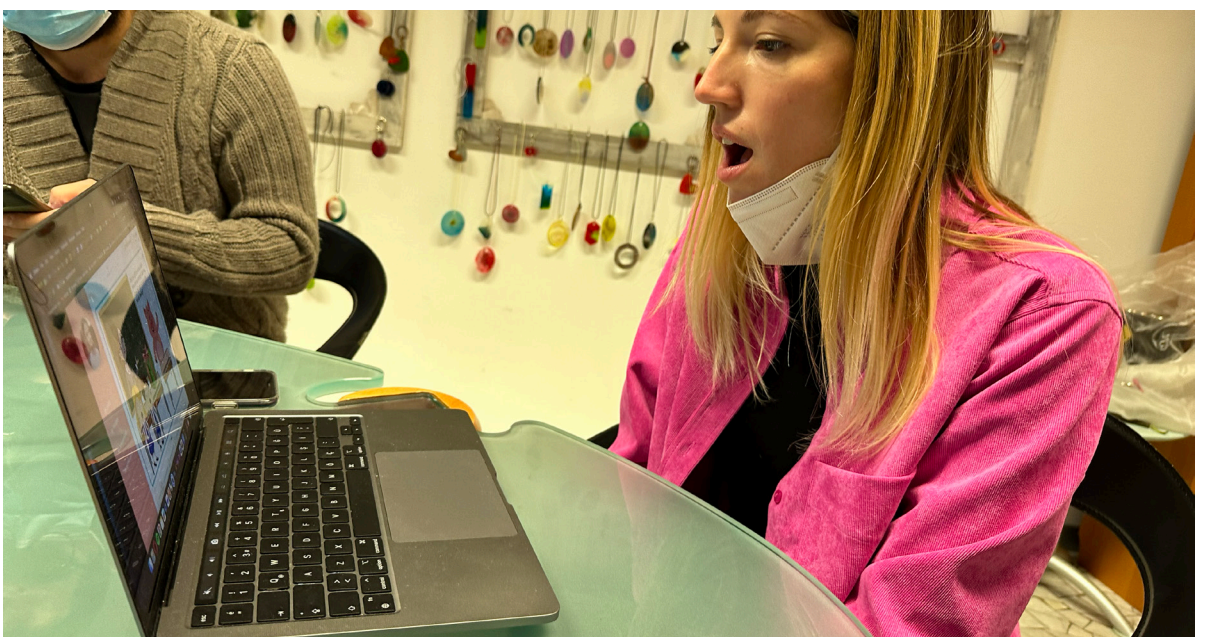
Task 1 → *
Task 2 — * full story
doing good

parent ↓
focus on performance
focus on emotion

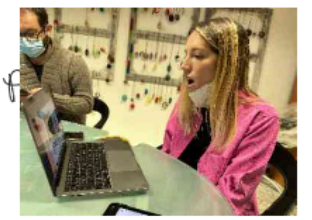
USER TESTING INTERVIEWS

PARTICIPANT 3

In the user testing I have created a questionnaire and concent form.



Name = Alessia
Surname = Bongini
Age = 32
Occupation = Educator and physiotherapist
Location = Milan
Years of ex 3
Specialty = Physiotherapist



Section 1

- How are therapies done
-

Section 2

- User testing (pretending as kid)
  Its really nice
  No digital things

Section 3

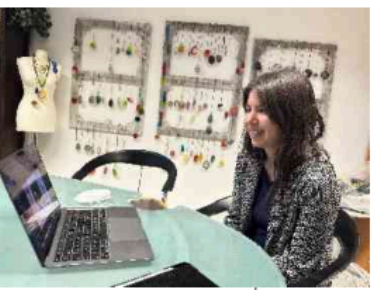
Open ended feedback

USER TESTING INTERVIEWS

PARTICIPANT 4

In the user testing I have created a questionnaire and concent form.

Name = Sara
Surname = MAGENGS
Age = 31
Occupation = Physiologist PM
Location = Milan
Years of ex 10
Specialty = Neurodevelopment Disorders



Section 1

- How are therapies done
-

Section 2

- User testing (pretending as kid)
→ Very interesting
→ Real life videos is perfect
→ facial express for lower functioning

Real images of goals in abstraction
Children prefers real images

Section 3

Open ended feedback

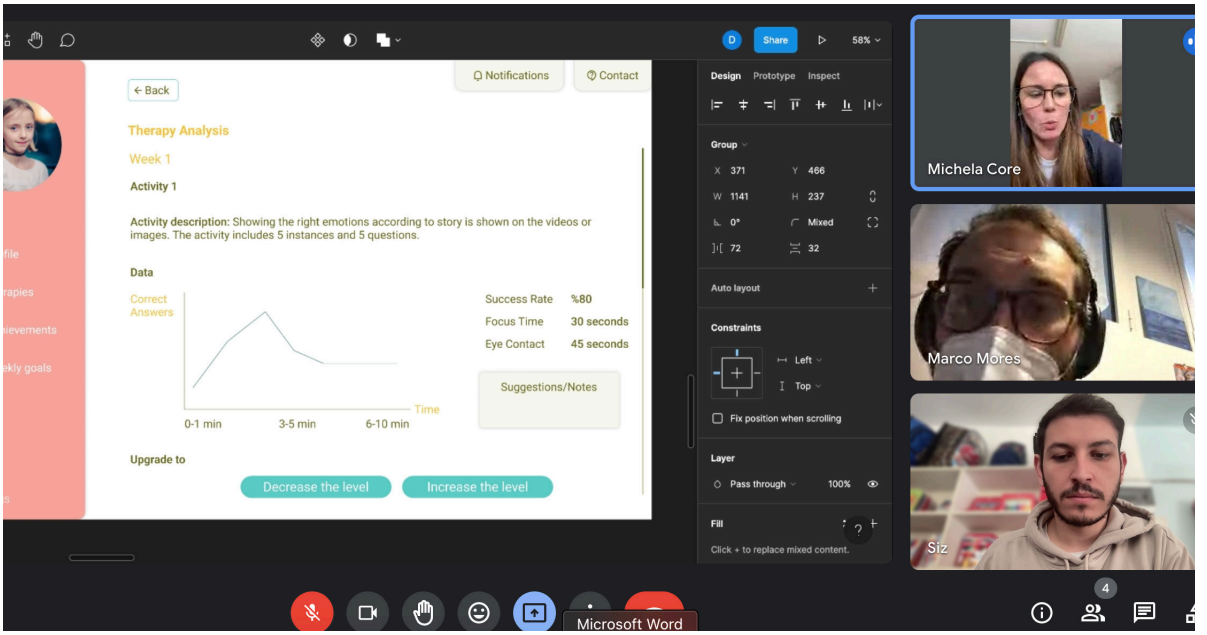
→ Children prefers fun food
→ personal choosing options

→ Change suggestion more than 1

USER TESTING INTERVIEWS

PARTICIPANT 5

In the user testing I have created a questionnaire and concent form.



Name = Michela

Surname = Care

Age = 35

Occupation Neurodevelopment Therapist

Location = Abruzzo

Years of ex 13

Specialty = Applied behavioral analysis

Section 1

- How are therapies done
-

Images should be real photos of the kid

Her his bike etc

Overall good project

but we are always thinking that everything goes as expected what happens if some problems occurred

Parents note or connection can be a thing

Section 2

- User testing (pretending as kid)

→ Very interesting
→ Real life videos is perfects
→ facial express
for lower functioning

Section 3

open ended feedback

→ children prefers
few food
→ personal choosing
options

Real images
of goals
in abstraction
children prefers
real images
→ Choose suggestion
more than 1