



OLFACtORY MEMORY

Service System Design

User Experience Design

Jiang Wanting 2023.5-2023.11

Introduction

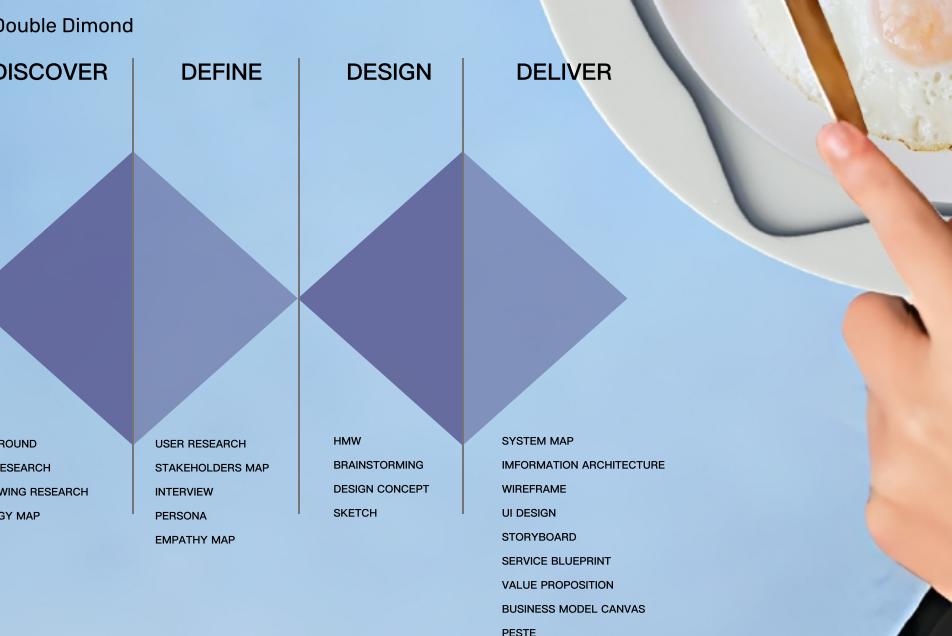
The 'Olfactory Memory' Project Employs Olfactory Memory And Electronic Scent Technology To Enhance The Dining Experience For Children With Autism Spectrum Disorders Struggling With Eating Disorders.

Purpose

Our Goal Is To Help Children With ASD Overcome Dietary Challenges Linked To Sensory Sensitivities And Improve Their Mealtime Comfort. Releasing Familiar Scents Aims To Reduce Food-Related Anxiety, Promote Diverse Tastes, And Enhance The Well-Being Of ASD Children.



Product Service Design

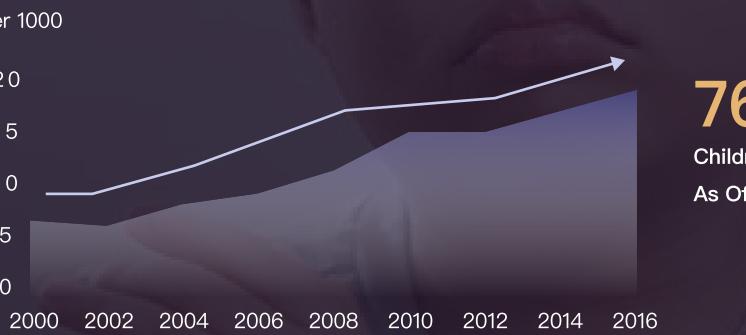


BACKGROUND

Autism spectrum disorders are neurodevelopmental disorders that begin in infancy and early childhood and are characterised by varying degrees of impairment in social communication and interaction, with narrow interests and repetitive and stereotyped movements and behaviours. In recent years, the prevalence of ASD has been on the rise.



About **1 in 54** 8-year-olds is diagnosed with an autism spectrum disorder.



Million
in With Autism Worldwide
October 2023

90% of children with ASD refuse to accept new foods.

80% of children with ASD are picky eaters and eat a very limited variety of foods.

The growing population of children with ASD and the range of problems caused by their abnormal eating behaviours deserve attention.

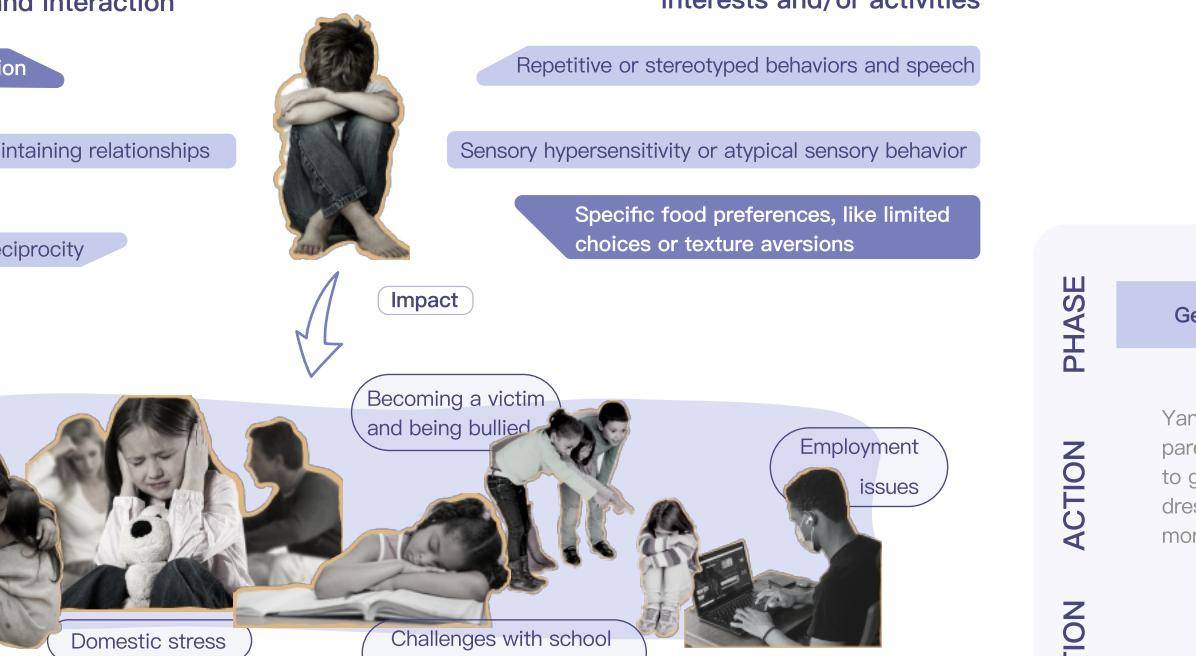
RESEARCH

Autism Spectrum Disorders

B. Restrictive, *versus* enabling

- The diagram consists of three blue speech bubbles arranged in a triangle around the central figure. The top-left bubble contains the word 'Sensory' and the bottom-left bubble contains 'Reciprocity'. The top-right bubble contains the word 'Repetitiv' and the bottom-right bubble contains 'Sensory hyper'.

 Impact



with ASD are unable to properly express their need
restrictive eating behaviour problems.

Causes of ASD in children are congenital and difficult to improve
-
Functional training with low likelihood of cure later in life

ASD is associated with greater social impairment in family members with ASD patients.

ASD is associated with genetic variations and may involve multiple genes. Family members with ASD patients have a higher risk of developing ASD, and some studies suggest that mutations or deletions in specific genes may contribute to ASD

actor Prenatal and early childhood

actor Prenatal and early childhood environmental factors, including infections, maternal chemical exposure, preterm birth, low birth weight, and birth asphyxia, are associated with a higher risk of ASD.

ASD may be linked to irregu-

ctor ASD may be linked to irregularities in brain development, such as disrupted neuronal connections and synaptic remodeling during brain growth.

HADOWING RESEARCH

This field study observed a child named Yangyang, and we followed him throughout his school day to discover and research the problems he encounters in his life.

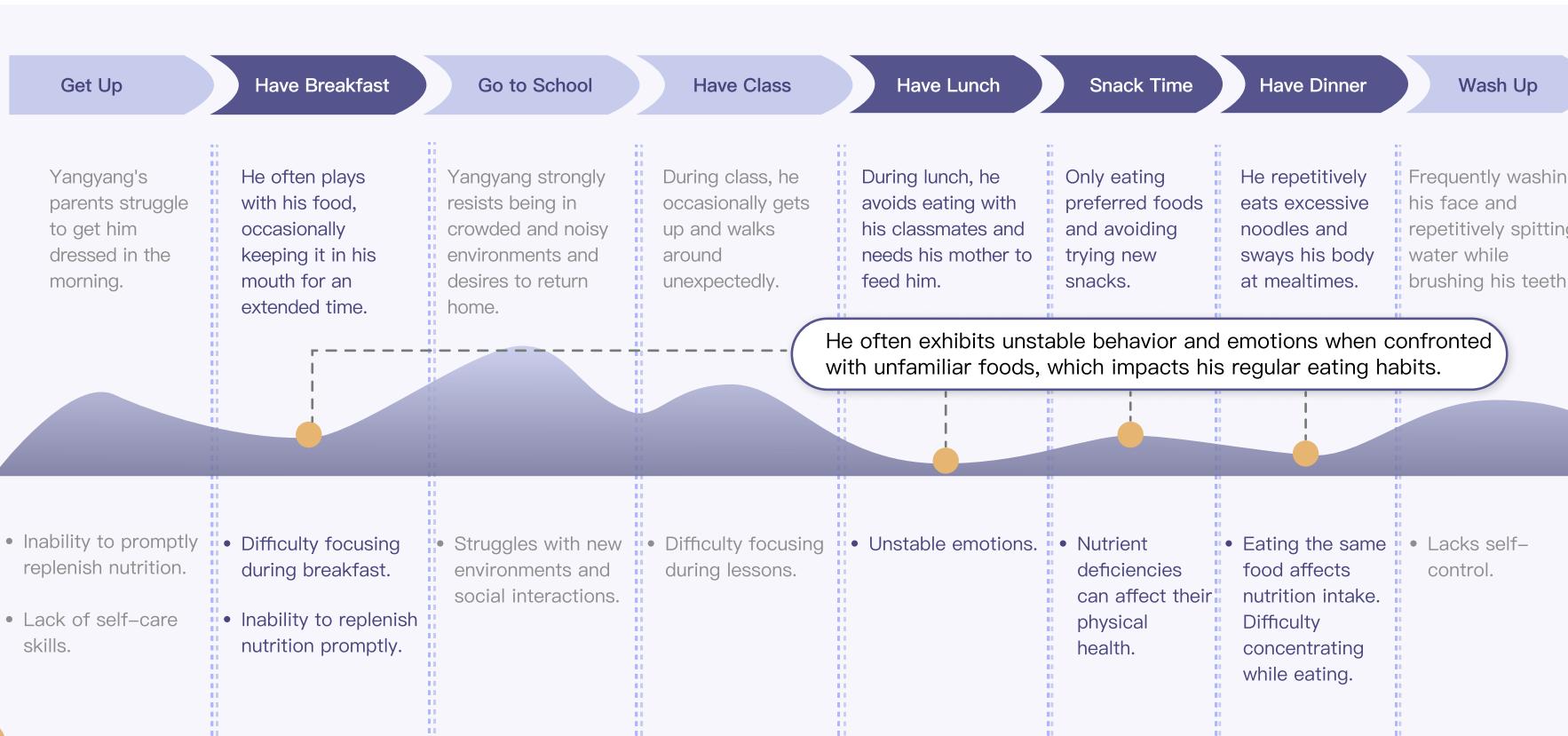


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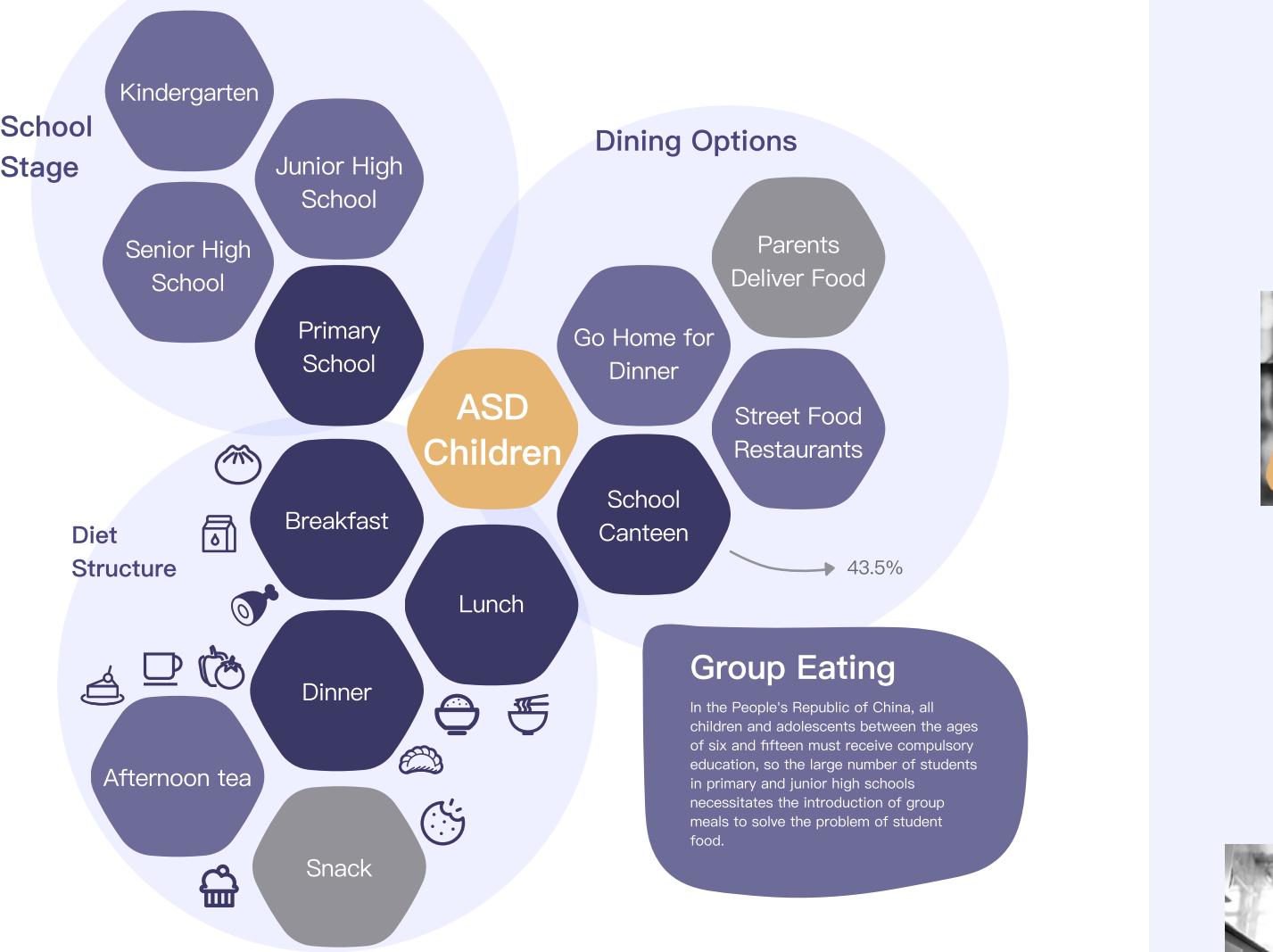
- He is in first grade this year
 - His mother takes care of him full time
 - Attending a mainstream elementary school



Observations indicate that there are numerous dietary issues to be addressed and researched in the lives of ASD patients.

■ ECOSYSTEM MAP

The symptoms of autism are more pronounced the younger the child is, and research has found that autistic children at primary school level face a range of problems associated with communal eating that are of greater concern to us.



■ USER RESEARCH

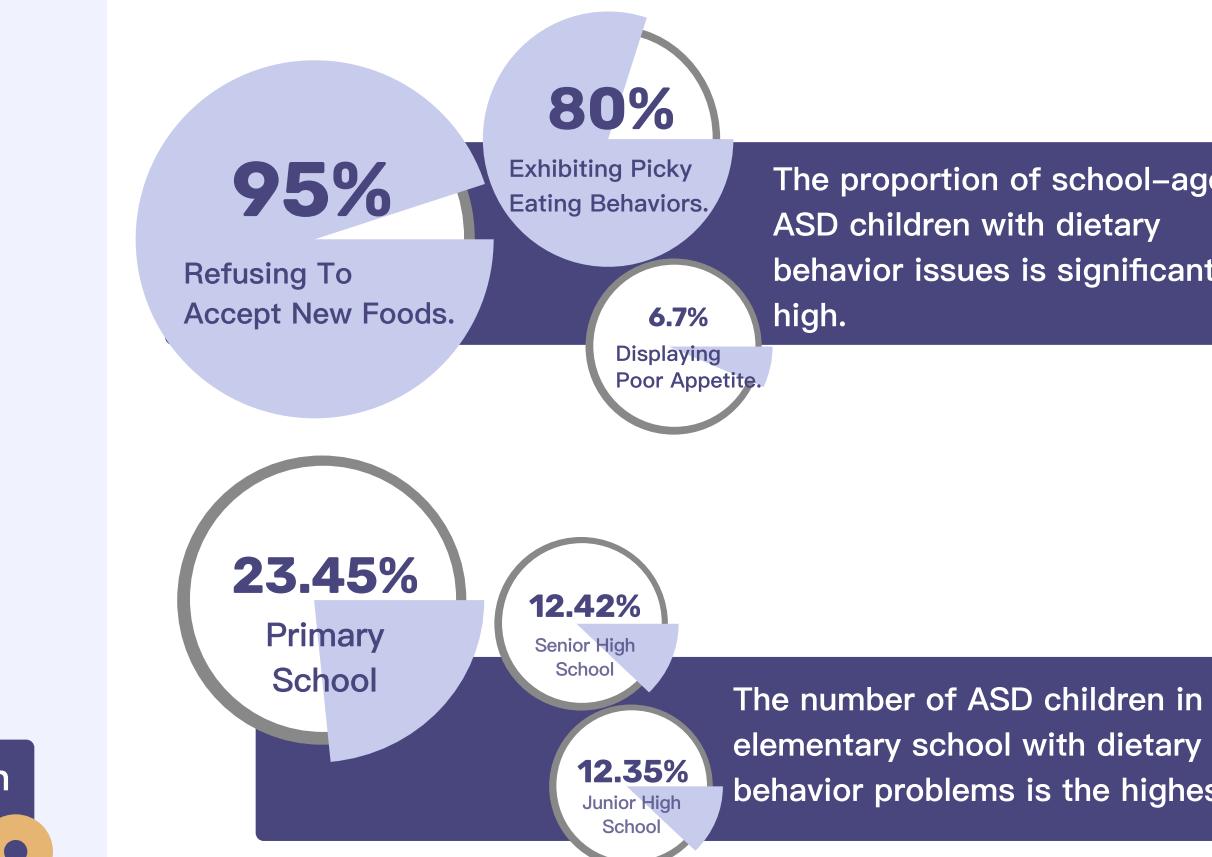
Through user research, we've identified the origins and impact of eating behavior issues in children with ASD.



Population Proportion of ASD Patients and Eating Behavior Problems



The prevalence of dietary behavior issues in ASD children is notably higher than in typical children.



■ INTERVIEW

I interviewed three people closely involved with ASD, a child with ASD, a mother of a child with ASD, and the thoughts on ASD of an expert who focuses on people with ASD.



Yangyang, a 6-year-old with autism, is currently in the first grade of primary school



Yangyang's mum, a 6 years parent of an autistic child



我迫切地想找出其中的答案
Research ASD Specialist

“I only eat food I've had before because I'm **afraid of trying new things**. The sensation of spicy foods is something I dislike.

"I have a specific order for eating, starting with meat and then moving on to vegetables and rice. If I can't eat in this order, I become anxious."

"I'll only eat at our dining table at home; eating elsewhere makes me very uncomfortable."

"I tend to chew my food quite vigorously. I know it's not good, but I don't know how to change it."

Children with autism are very particular about what they eat and will only eat familiar foods

“My child has **particular food preferences** for certain foods and resists trying new things. I hope he can be more open to **trying various types of food**.

"My child needs to eat at specific times, in a particular place, and in a certain way, or he feels extremely anxious. This is a challenge for us, especially when dining out."

"I make an effort to prepare the foods my child likes, but it's a challenge for our family budget and time. I wish there were more resources and support to help address these issues."

"Nutrition is essential for my child's health, but ensuring a balanced diet during group meals is challenging. I sometimes feel helpless and frustrated."

Parents of children with ASD have a hard time finding ways to fit their children's unique eating behaviours

“While researching dietary challenges in ASD children, we've uncovered varied **food preferences and aversions**, as well as **specific scent preferences**. These factors can impact their dietary habits, nutritional intake, social interactions, and overall quality of life."

"We recommend parents and caregivers understand their child's food preferences and restrictions, offer diverse, balanced choices, and focus on their nutritional intake to prevent deficiencies and imbalances."

"Providing a stable and calm dining environment helps children better enjoy their meals and reduces anxiety and tension."

Society doesn't take ASD children seriously because ASD children have trouble expressing their needs

■ PROBLEM TREE

Immediate cause

- Selective eating and restrictive dietary behavior in ASD children create challenges for parents in meal planning.
- The unique dietary needs of ASD children increase the financial burden on parents.
- ASD children's physical and psychological health issues are closely related to their diet.
- Dietary problems in ASD children may result in malnutrition and health issues.

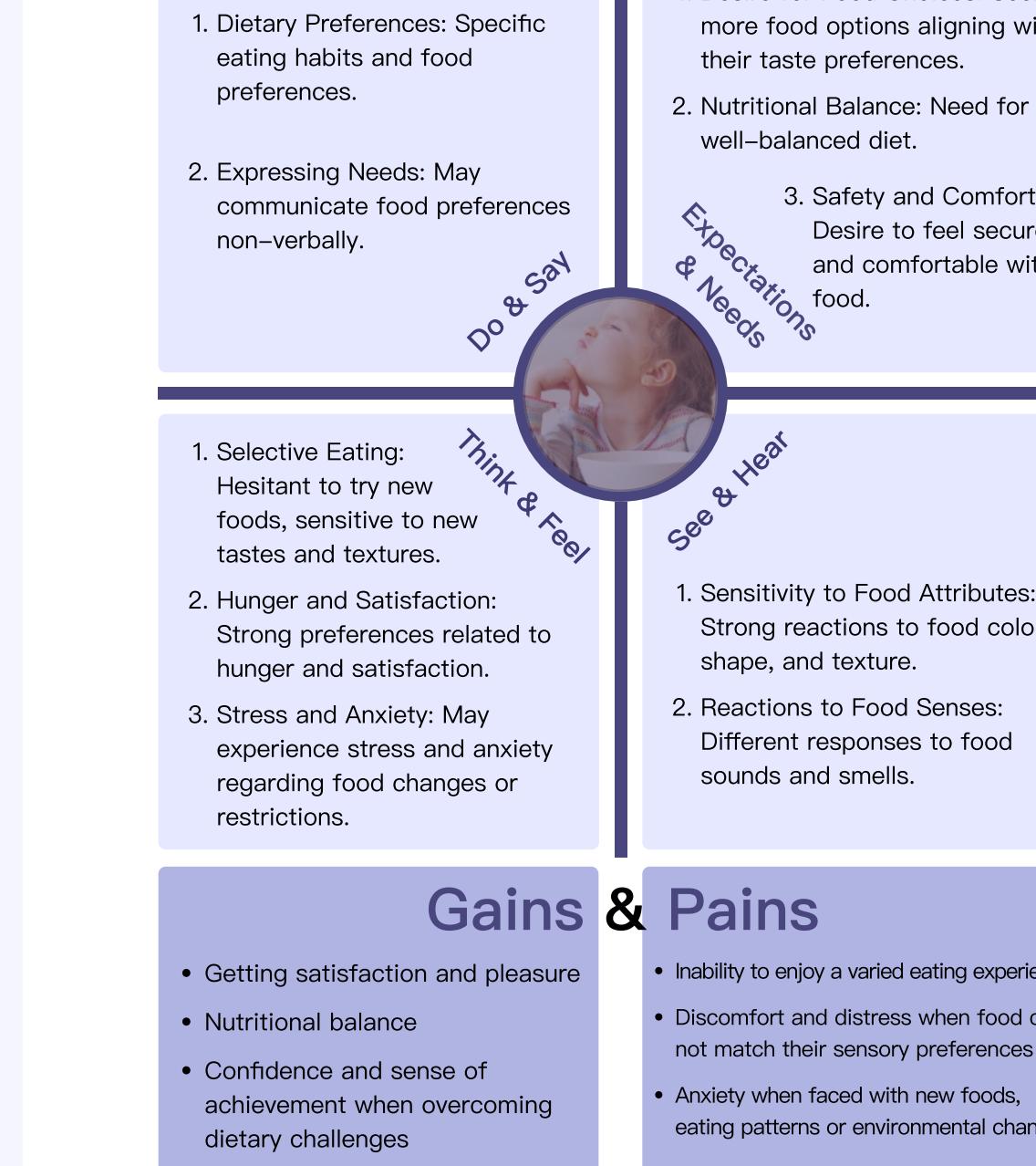
Indirect cause

- ASD children and their parents lack social support and resources.
- They face social and cultural pressures due to the uniqueness of their condition.
- Due to a lack of systematic understanding of ASD, ASD children and their parents lack relevant knowledge and skills.

Root cause

- Food allergies or intolerances can lead to the rejection of many foods, resulting in nutritional deficiencies.
- Ingrained daily dietary habits are challenging to change, making it difficult to align with guidance from teachers and parents.
- ASD children, because of their food neophobia, tend to be selective in their eating habits.

■ EMPATHY MAP



■ PERSONA



Katrina

An ASD Child
Age: 6

"I don't want to try new foods, just foods that make me feel safe and familiar."

GOAL

Comprehensive nutrient intake,
boosting immunity
Adapting and feeling secure during
communal school meals

NEED

Requiring external regulation for a
sense of security
Needing support from people
around

FRUSTRATION

Strict dietary requirements
Lacking a sense of security during
communal meals

PAINPOINT

Lack of specialized care at school
Lacking self-regulation ability



Adventurous Selective

Dependent

Independent



Anna

Mother of an
autistic child
Age: 30

GOAL

Minimizing the effort spent on a
child's specialized diet
Hoping the child is willing to try a
variety of foods to ensure nutrition

NEED

Requiring external help to regulate
the child's eating habits
Needing help and support from
various aspects of society

FRUSTRATION

Insufficient time and energy
Unable to adjust the child's eating
habits

PAINPOINT

Unable to provide care for the
child's diet at school
Overwhelming energy burden
Food preparation is cumbersome



Calm

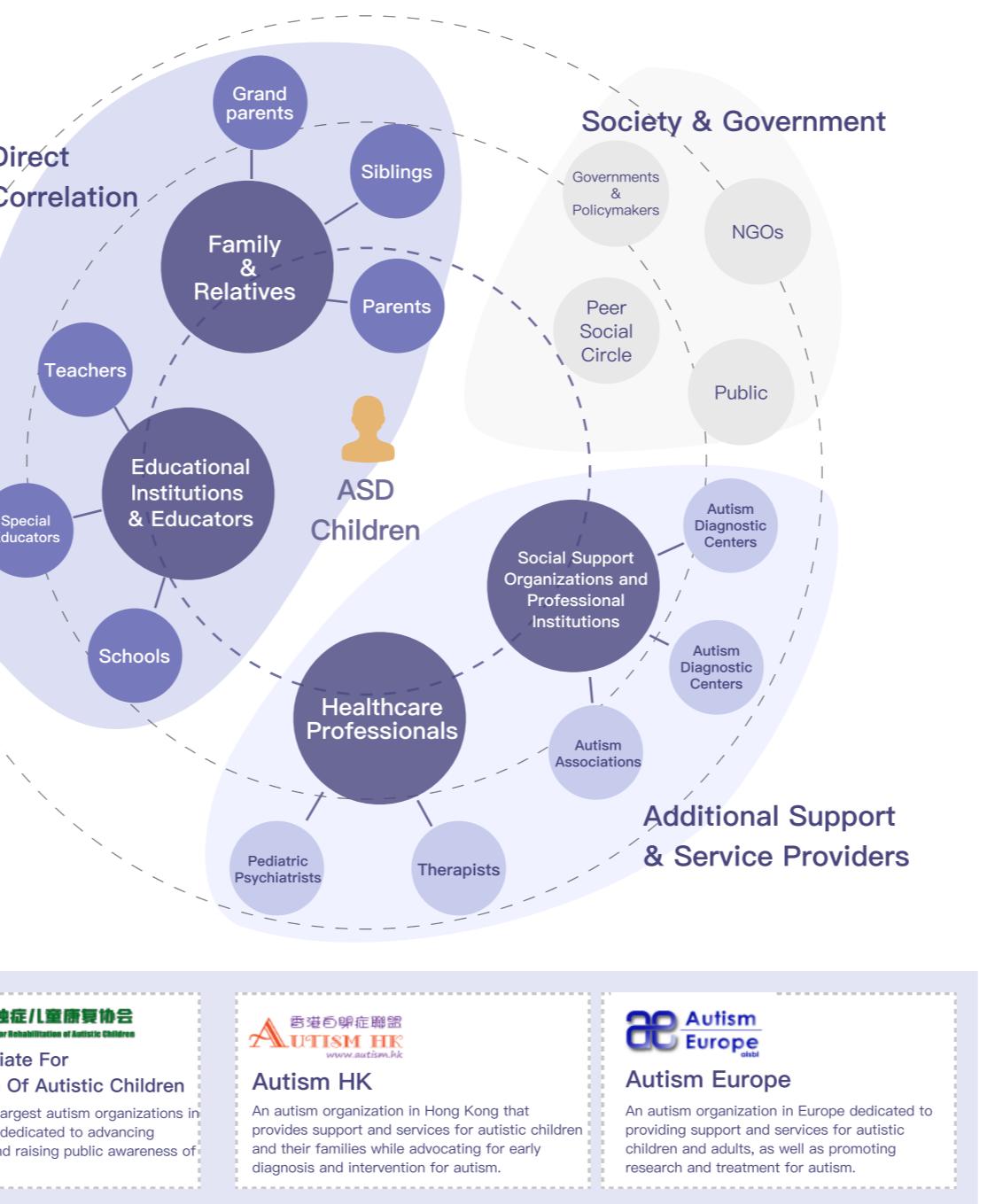
Anxious



Self-sufficient

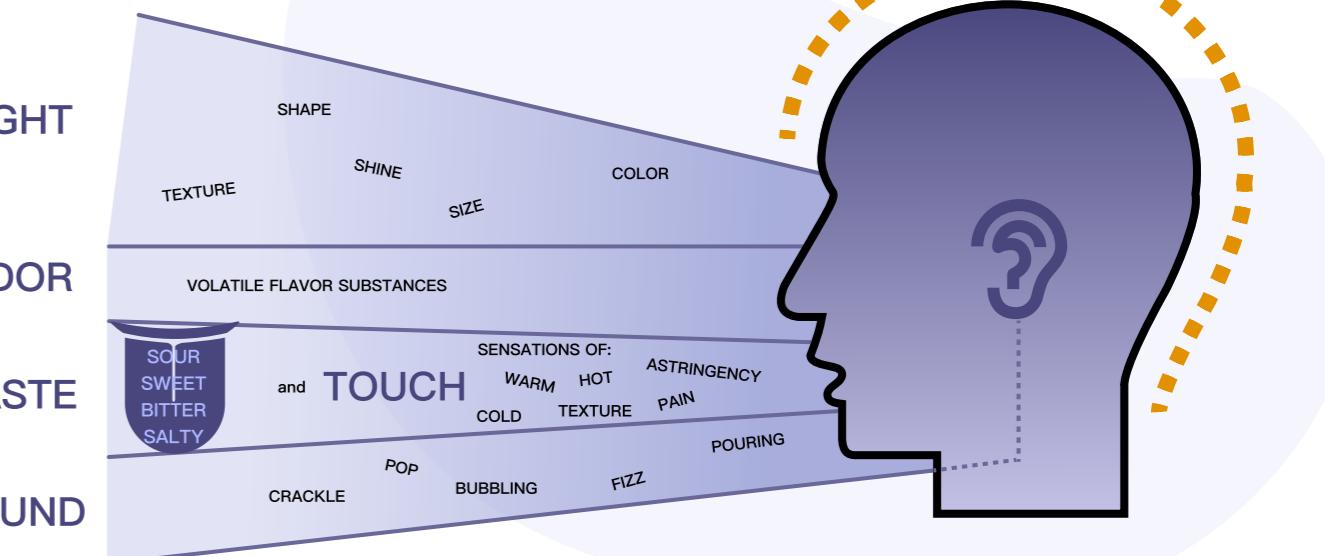
Need help

■ STAKEHOLDER MAP



■ DESIGN THINKING

Factors Affecting Food Choices In Children With ASD



Eating Behaviour Problems And Daily Nutritional Intake

Correlations between problematic eating behaviors and nutrient composition are listed.
 $r = \pm 0.4$ or higher statistically significant associations are stronger. [1]

	Features of Autism	Food Refusal	Limited Variety
Taste/Smell	-0.26	-0.46	-0.73
Tactile	-0.07	0.05	-0.25
Visual Auditory	-0.06	-0.08	0.25
Auditory Filtering	-0.01	0.22	0.23

[1] Chistol LT, Bandini LG, Must A, Phillips S, Cermak SA, Curtin C. Sensory Sensitivity and Food Selectivity in Children with Autism Spectrum Disorder. J Autism Dev Disord. 2018 Feb;48(2):583–591. doi: 10.1007/s10803-017-3340-9. PMID: 29116421; PMCID: PMC6215327.

Since a child with ASD has the strongest correlation between the gustatory and olfactory factors and his intake of nutrient levels, I would like to approach the problem from this aspect.

■ HMW

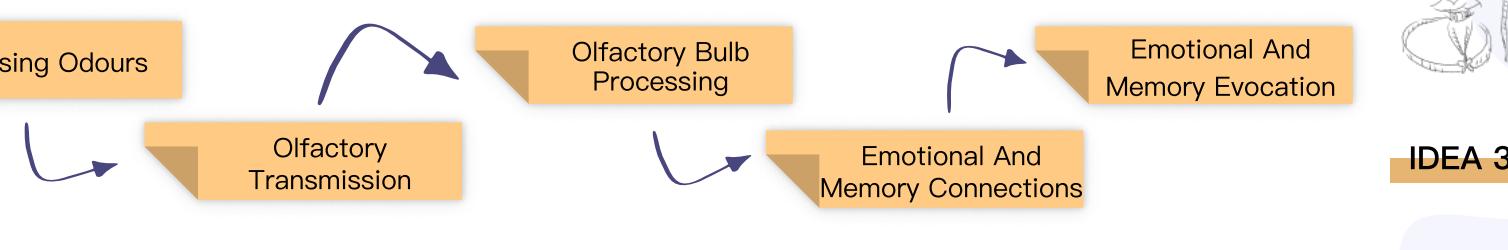
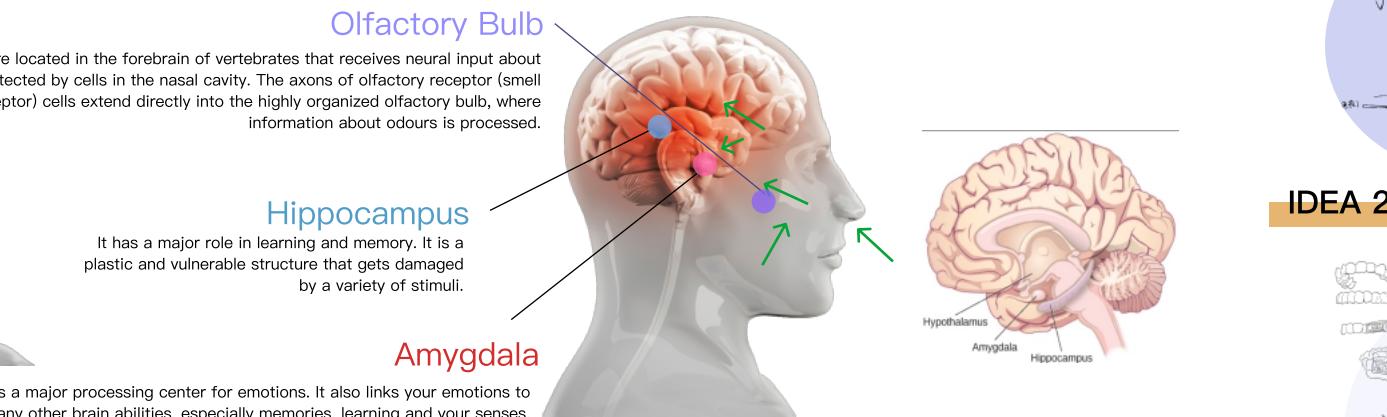
How might we integrate technology and innovative solutions to help ASD children and their families make more informed and enjoyable dietary choices, addressing their unique sensory challenges?

- HMW modify the tactile sensation of foods ASD children touch to match their preferences?
- HMW create a harmonious and comforting visual experience for ASD children while observing food?
- HMW intervene in the olfactory process of children with ASD to trigger familiar scents during meals?
- HMW regulate ASD children's auditory senses to adjust their eating pace and mood?

■ BRAINSTORMING

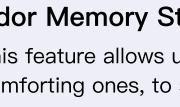
Olfactory Memory

The phenomenon that specific smells or tastes can evoke strong memories and emotional recollections of the past. The olfactory bulb, the neural structure by which we perceive smells, is closely related to the amygdala and hippocampus, the neural structures that control emotions and memories.

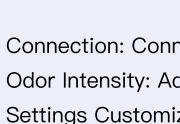


Concept

OLFACTORY MEMORY



Device



APP

Odor Memory Storage

This feature allows users to save scents associated with food, particularly pleasant or comforting ones, to stimulate appetite in children with Autism Spectrum Disorder (ASD).

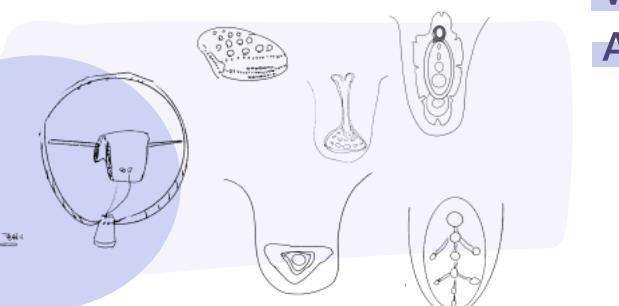
Odor-Released

The Odor-Released Meal Tray emits stored scents during meals for children with ASD, enhancing their mealtime experience and nutritional intake with familiar, comforting smells.

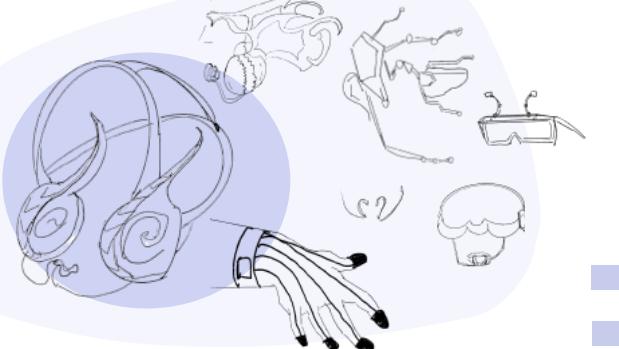
- Connection: Connect to the Odor-Released Meal Tray for synchronized scent release.
- Odor Intensity: Adjust odor strength to personal preferences.
- Settings Customization: Fine-tune scent release settings and schedules.
- User-Friendly Interface: Easy-to-use interface for seamless navigation.

■ SKETCHING PROCESS

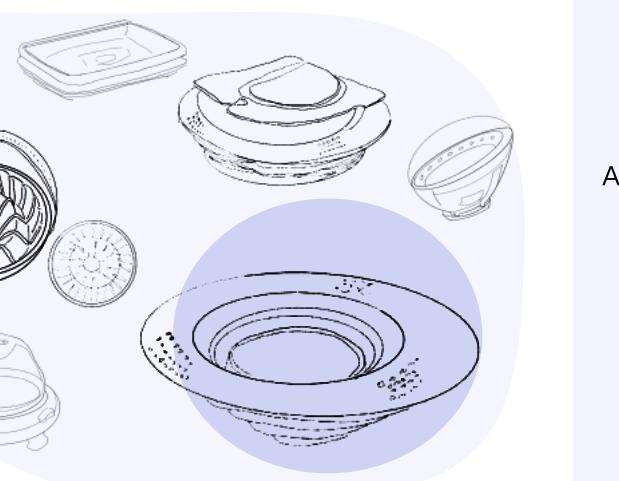
IDEA 1 Odour Release Stickers



IDEA 2 Wearable Device



IDEA 3 Dinner Plate



■ PREFERENCE TESTS

WHICH ONE DO YOU ACCEPT MORE?



WHY CHOOSE A ODOR-RELEASED DINNER PLATE?

Dinner Plate

Scent Dispersal Effect

Acceptance

Applicability

Consistency Of Experience

Convenience

Wearable Device

Scent Dispersal Effect

Acceptance

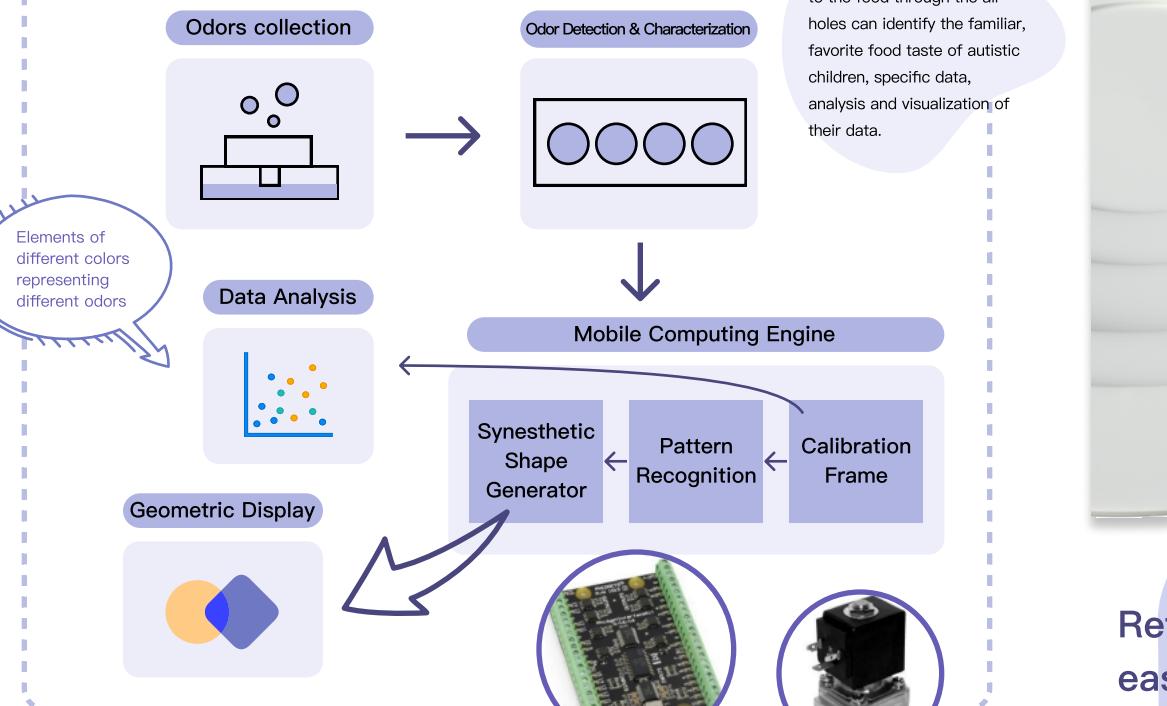
Applicability

Consistency Of Experience

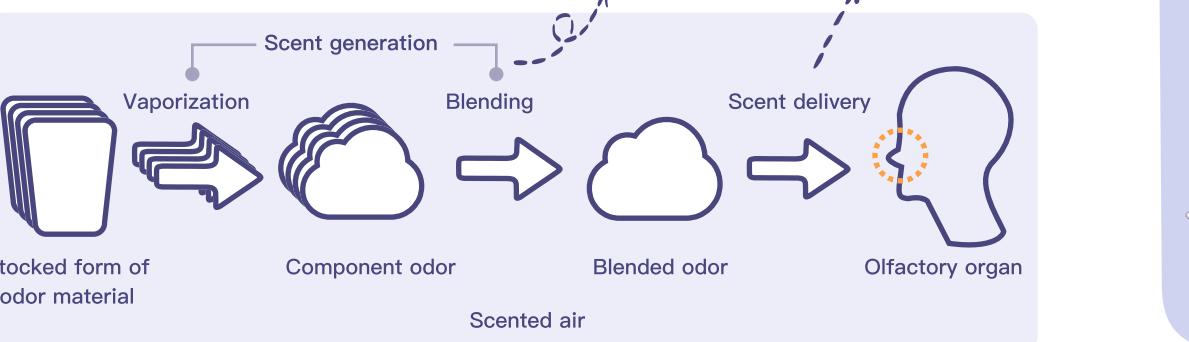
Convenience

■ TECHNOLOGY SUPPORT

Electronic Nose



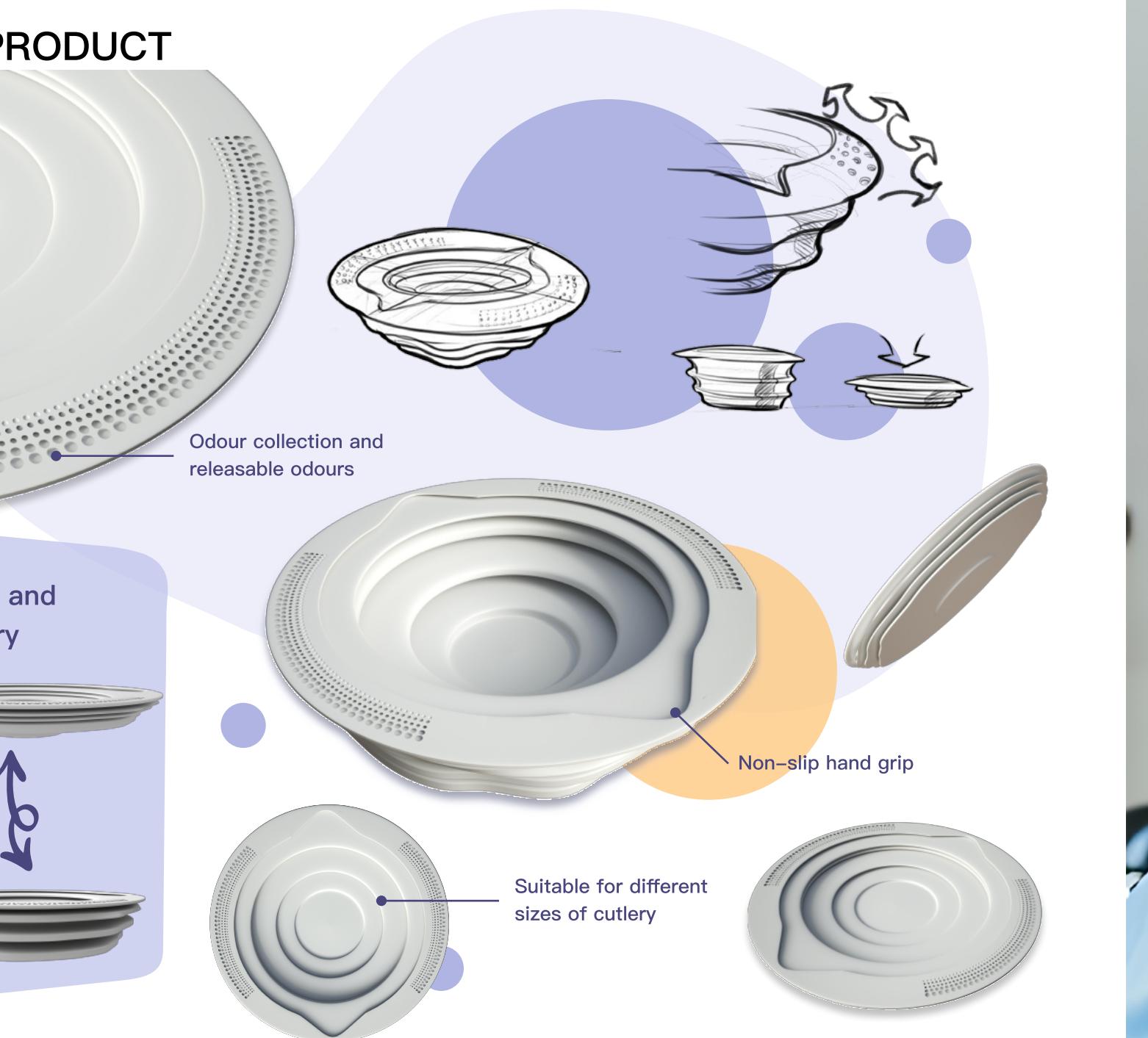
Odor Generation & Scene Delivery



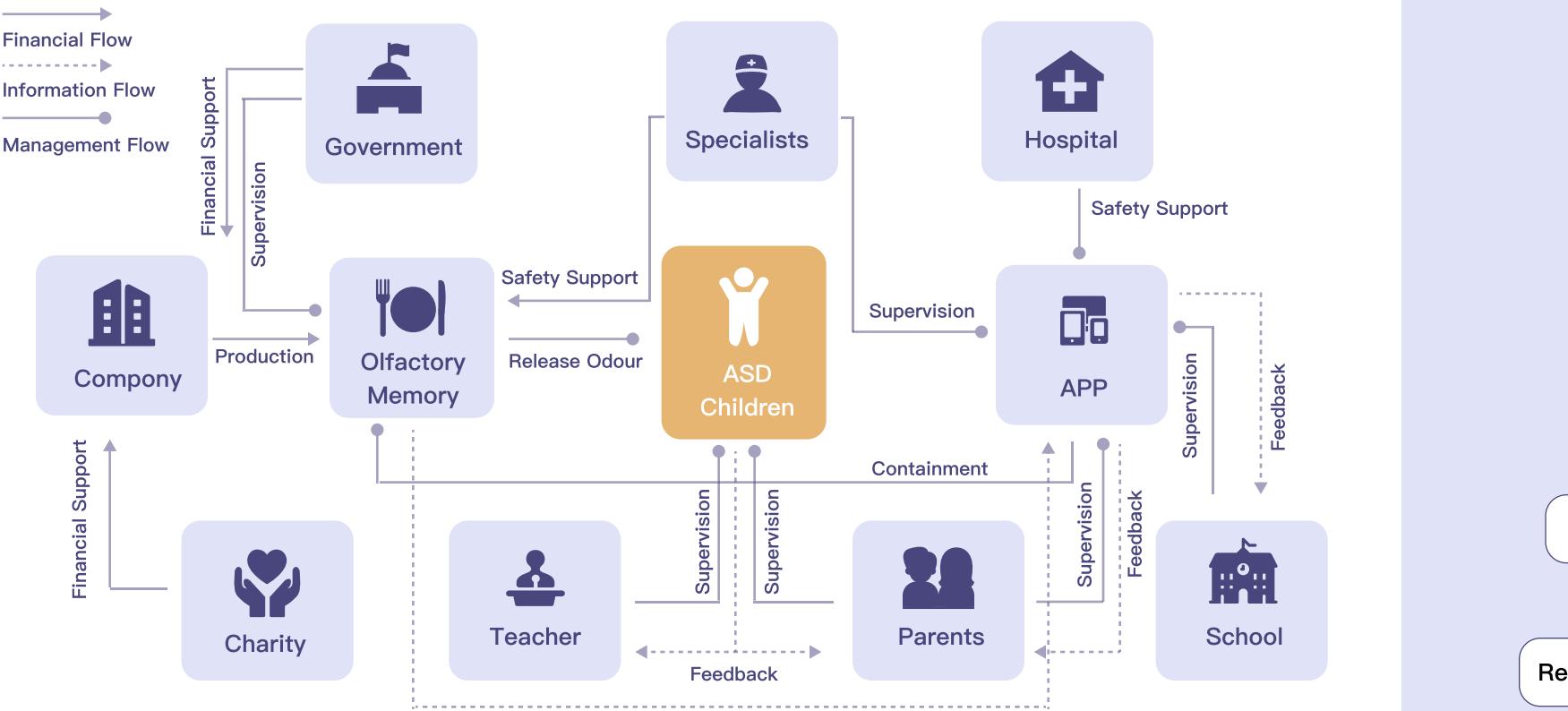
[1] Phidgets Model 1012 Phidget Interface Kit: Use it to check the status of switches and pushbuttons, and/or to switch relays, solenoids and LEDs.

[2] Solenoid valve: The system is equipped with a 5V DC external power supply to control a 5V DC solenoid valve supplied with the odor delivery system.

■ FINAL PRODUCT



■ SYSTEM MAP



Company

The project's primary initiator. They are responsible for the project's design, development, and manufacturing. They collaborate to develop a meal tray with embedded odor-releasing technology to meet the needs of children with autism.

Parents

Parents are crucial beneficiaries of the project. They select and use the scent-releasing meal tray, requiring training to support their children in developing healthy eating habits.

Hospital

Healthcare institutions offer professional advice and support to ensure that the health needs of the children are met. They may also drive research to improve this technology.

Charity

Charities are essential for the project, offering vital financial support, resources, and promotion to ensure the project reaches more children and provides essential assistance.

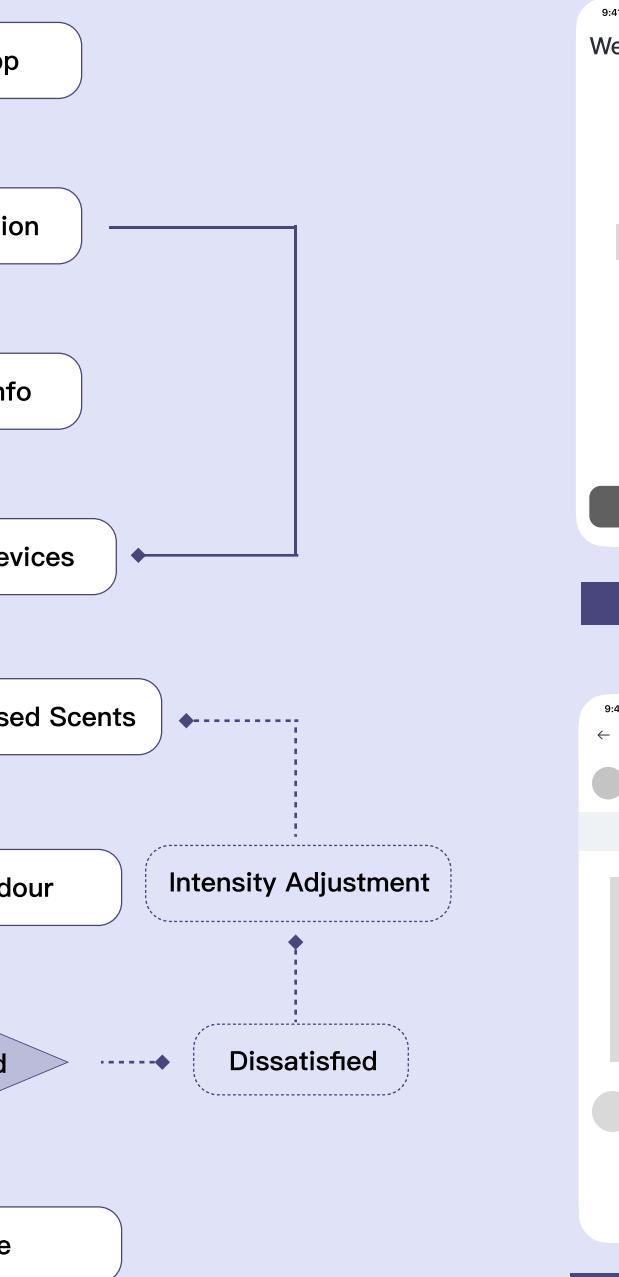
School

Schools are project partners. They collaborate closely with parents and healthcare institutions to ensure that children with autism can also benefit from this technology in school cafeterias.

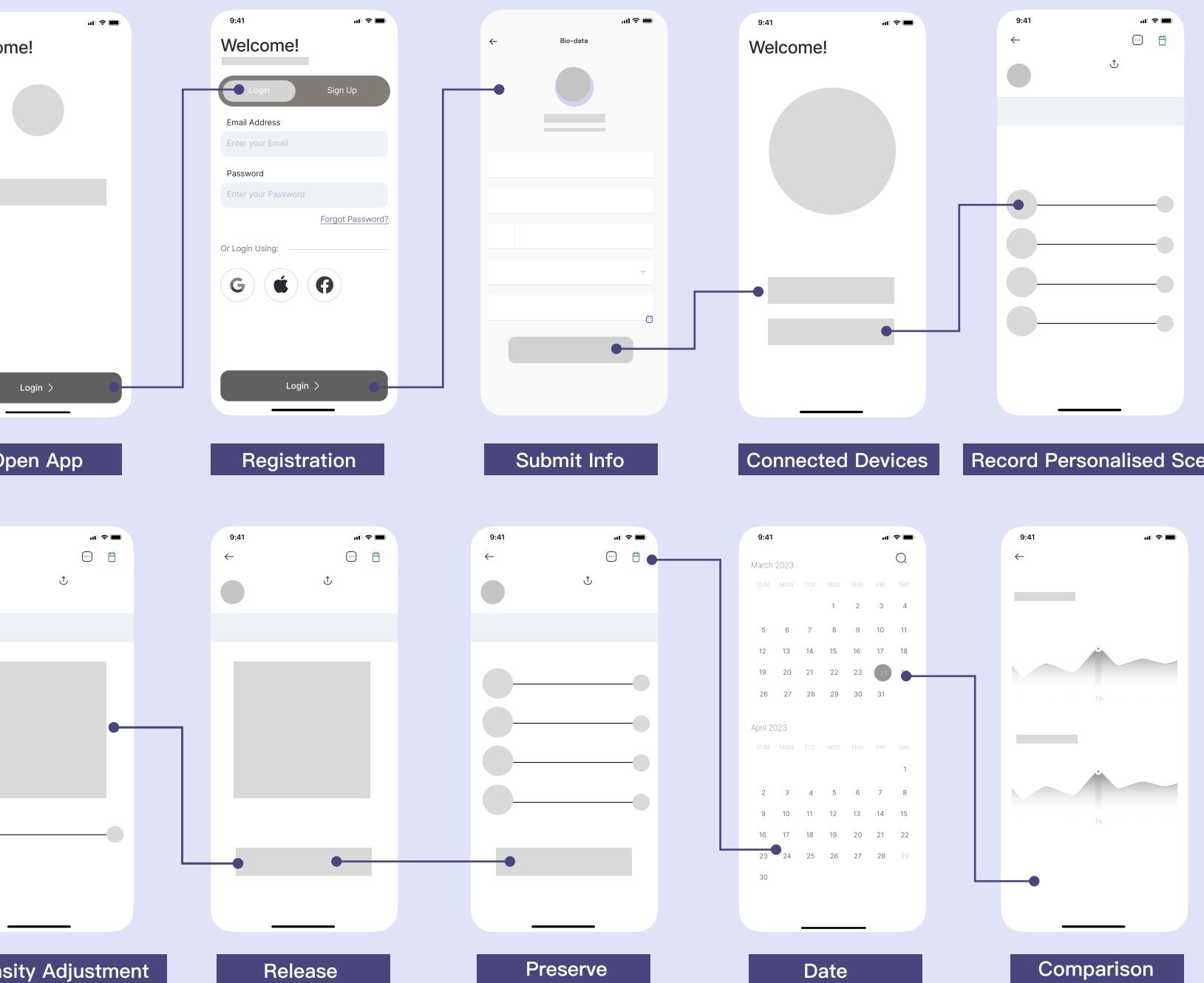
Government

Governments regulate and establish policies to ensure safe technology use and may offer financial support for project development and implementation.

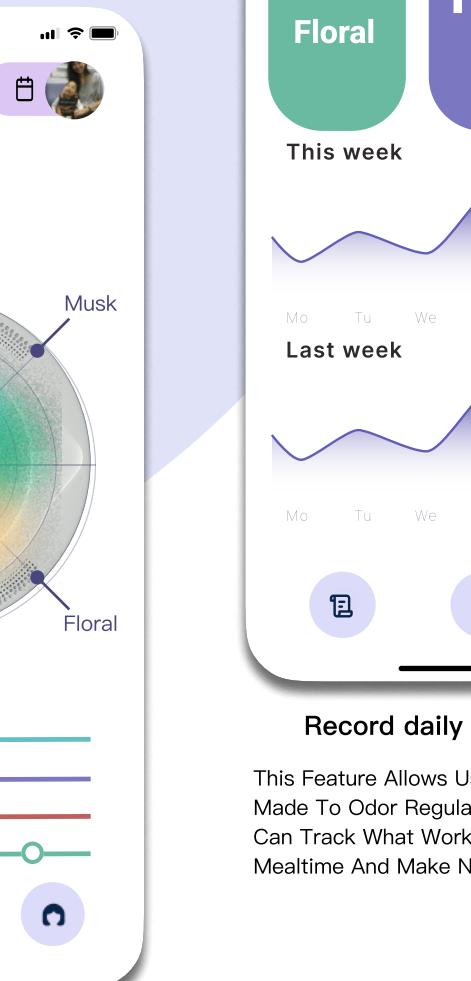
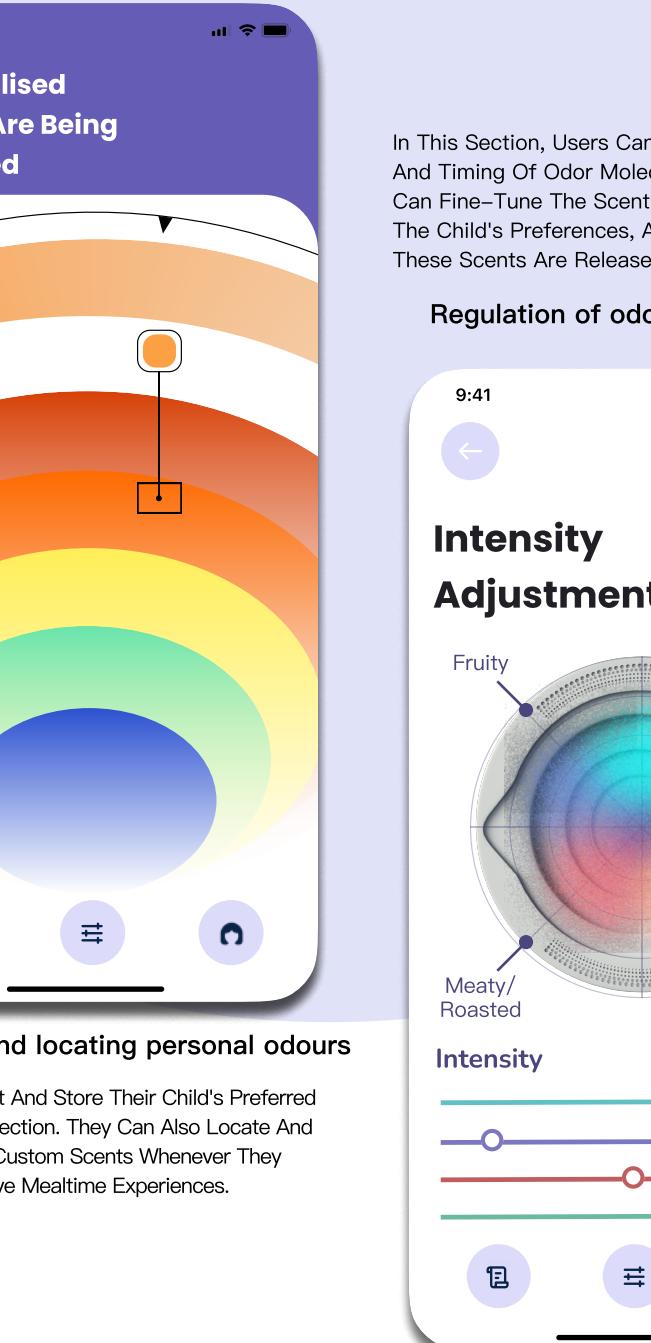
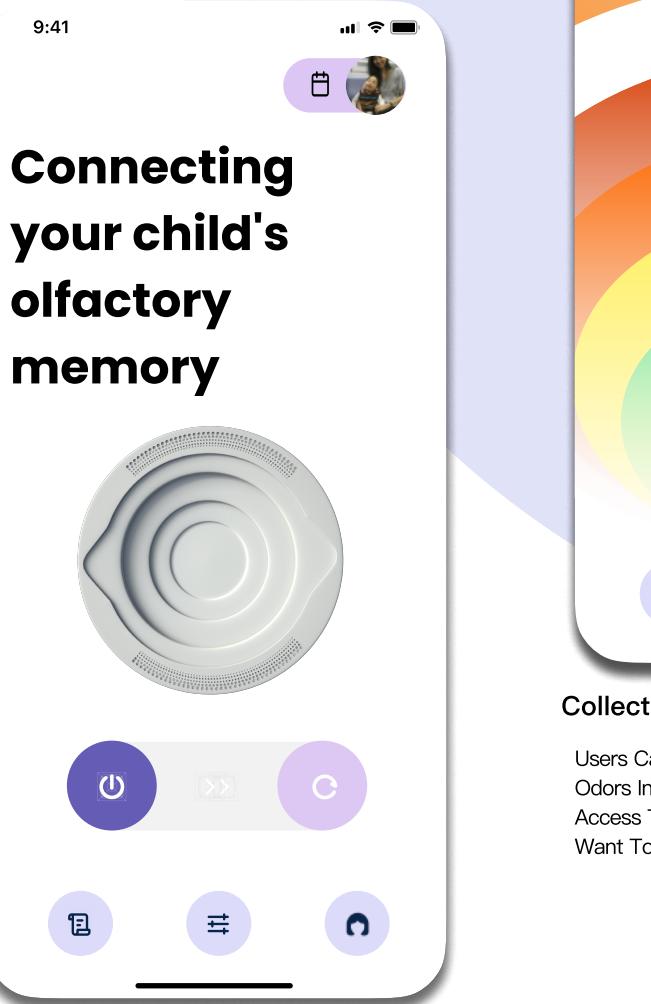
■ USER FLOW



■ WIREFRAME



■ HIGH FI INTERFACE



FACTORY MEMORY



■ PESTE



■ STORYBOARD



■ ITERATION



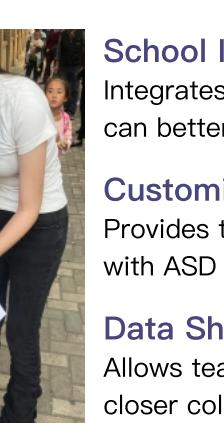
Parents



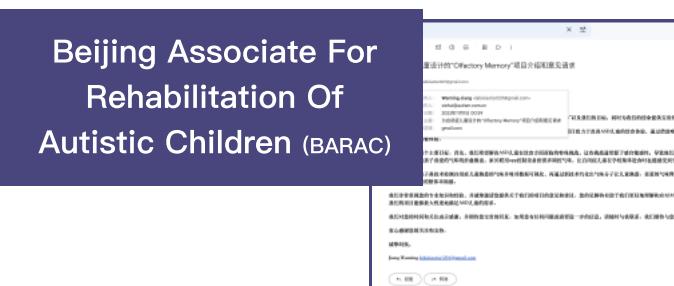
ASD Children



Teachers



ASD Children



Data visualisation: Provide **more powerful data visualisation tools** so that parents have a **clearer picture** of their child's dietary performance.

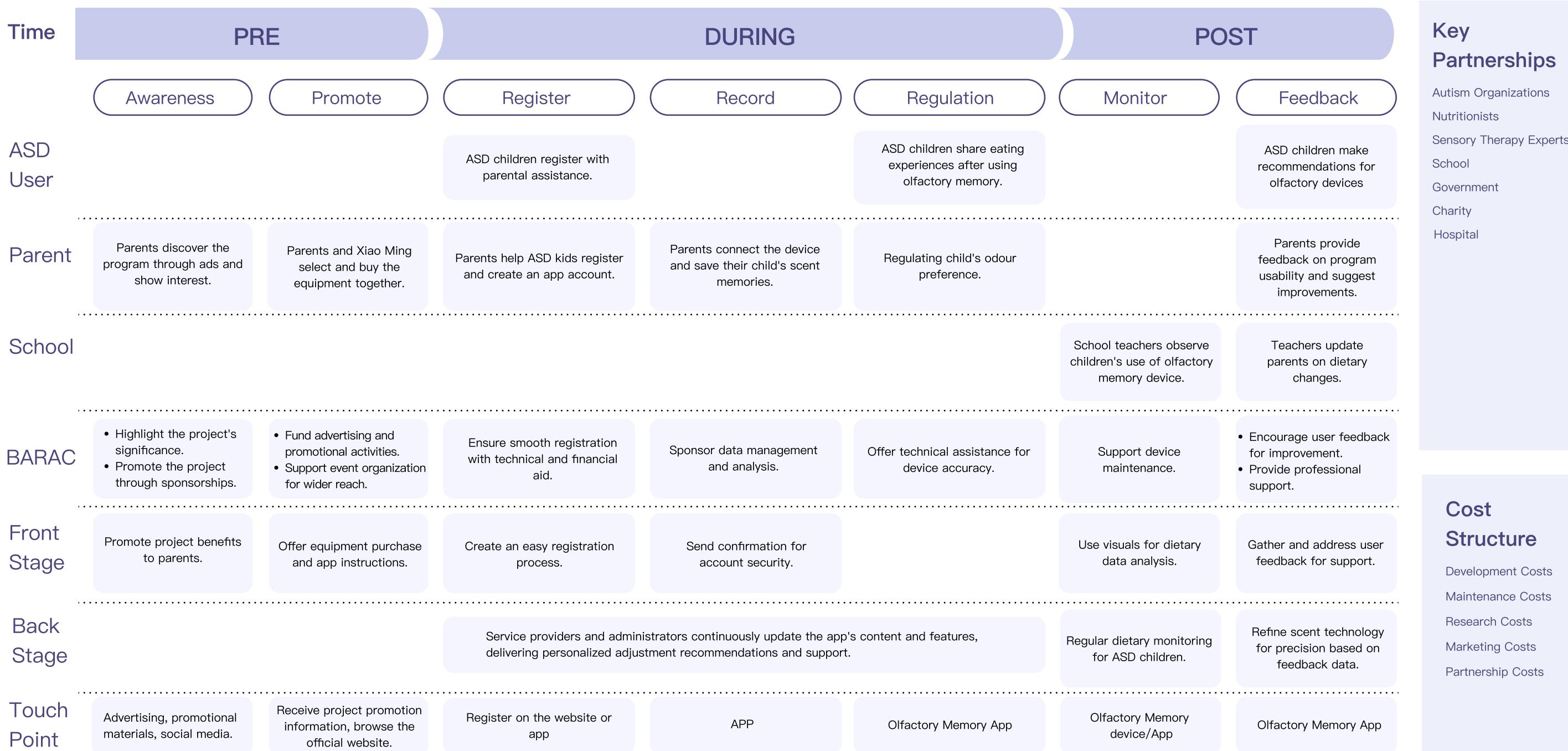
Community interaction: Consider creating a community of parents where they can share experiences and advice and support each other.

School Integration: Integrates the programme into the school environment so that teachers can better monitor and support the diets of students with ASD.

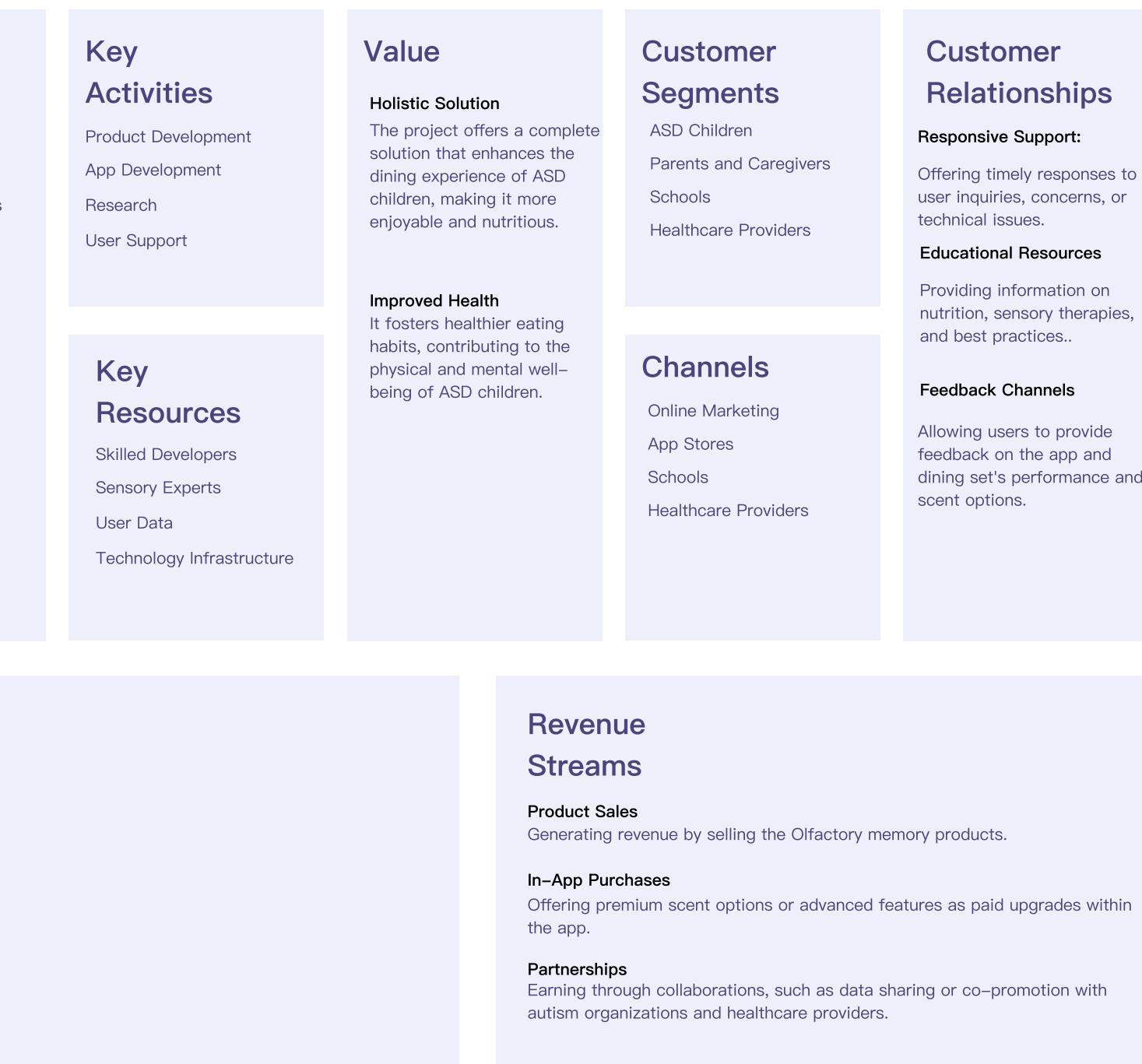
Customised Education: Provides teachers with training and resources on how to support students with ASD in the educational setting.

Data Sharing: Allows teachers to share their child's dietary data with parents to build closer collaboration and support.

■ SERVICE BLUEPRINT



■ BUSINESS MODEL CANVAS



■ VALUE PROPOSITION

Products & Service

Customizable Odor-Release Dining Set

A dining set designed with customizable odor-releasing technology, enabling children to associate their favorite scents with different foods.

Mobile Application

A user-friendly mobile app that connects to the dining set, allowing parents to control scent release and monitor their child's eating habits.

Scent Capsules

Specialized scent capsules with a wide range of scents to enhance the dining experience and encourage trying new foods.

Gains

Expanded Food Variety

ASD children adopt healthier diets through positive scent associations with food.

Improved Parent-Child Interaction

Parents actively engage in mealtimes, strengthening their relationship.

Convenience

Parents can oversee scent release and eating habits using the mobile app.

Pains

Cost

Initial investment required for dining set and app.

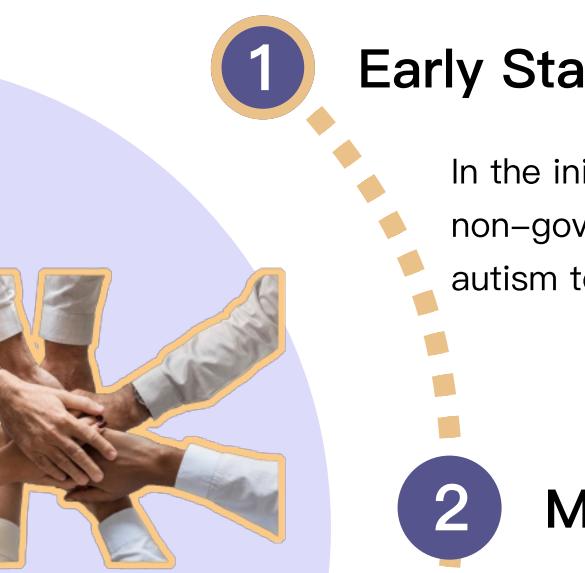
Learning Curve

Some parents may find it challenging to become proficient with the app.

Scent Selection

Available scents may not match every child's preferences.

■ FUTURE STRATEGY



1 Early Stage

In the initial phases of the project, collaborate with non-governmental organizations (NGOs) related to autism to secure support and resources.

2 Middle Stage

Strengthen partnerships with NGOs, including joint fundraising and activities, to expand the project's reach.

3 Post Stage

Deepen collaborations with multiple NGOs, including international NGOs, to promote the project's impact and sustainability.

■ FUTURE SCENARIOS

Future scenarios for your project from various perspectives:

Political



Technology



Environment