



AI Empowers Autism Nutritional Care Solutions: A Family-Centred Innovation

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Abstract: Autism Spectrum Disorder (ASD), affecting 1 in 36 U.S. children, presents profound feeding challenges—extreme food selectivity, sensory aversions, and mealtime meltdowns—that strain caregivers and jeopardize child health. Over 70% of caregivers report clinically significant stress, exacerbated by healthcare systems offering generic, neurologically disconnected dietary advice. This study introduces Feeding Assistant for Children with ASD, a personalized AI assistant grounded in the SPELL framework (Structure, Positive approaches, Empathy, Low arousal, Links) and health behavior theories (Social Cognitive Theory, Ecological Systems Theory). Built via participatory co-design with families, clinicians, and AI engineers, the tool delivers culturally sensitive, context-aware nutrition planning and feeding strategies. Over six weeks, a case study with a neurodiverse family demonstrated reduced caregiver stress (quantified via validated scales) and fewer mealtime refusals, validated through mixed-method analysis. The AI's empathetic tone, structured routines, and sensory-sensitive recommendations align with neurobiological insights, such as atypical connectivity in the amygdala and insula. Ethical safeguards—privacy protocols, bias mitigation, and cultural inclusivity—ensure dignity-centered care. Results advocate for systemic integration of AI into national health strategies, emphasizing equitable access, interdisciplinary training, and policy reforms to bridge gaps in ASD care. This AI model redefines technology's function as both a practical ally and an emotional anchor, building resilience in neurodiverse households.

Keywords: Autism-Sensitive AI; Nutritional Care Innovation; Family-Centred Design; Participatory Case Study; Compassionate Technology

Introduction

Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental condition affecting approximately 1 in 36 children in the United States, with global prevalence rates underscoring its significance as a public health priority (Maenner *et al.*, 2023; Maspul, 2021). Beyond diagnostic criteria of social communication challenges and repetitive behaviors, ASD profoundly shapes daily lived experiences—particularly in domains like feeding and nutrition. Up to 80% of autistic children exhibit severe feeding difficulties, including extreme food selectivity, sensory aversions to textures or smells, and anxiety-driven mealtime meltdowns (Al-Beltagi, 2024; Vogel *et al.*, 2023). For caregivers, these challenges

transform nourishment—a universal act of love—into a battleground of stress, guilt, and exhaustion. Over 70% of parents of autistic children report clinically significant stress levels, with mealtimes cited as a primary contributor to familial discord and caregiver burnout (Haytham *et al.*, 2022). Yet traditional healthcare systems often fail these families, offering generic dietary advice that ignores the neurological, sensory, and emotional complexities of ASD. This gap between clinical protocols and lived realities demands urgent innovation—one that bridges cutting-edge technology with profound human empathy.

The stakes could not be higher. Nutritional deficits in autistic children correlate with developmental delays, weakened immune systems, and exacerbated behavioral challenges (Al-Beltagi, 2024). Meanwhile, caregiver stress amplifies risks of parental depression, marital strain, and economic hardship due to lost wages or therapy costs (Haytham *et al.*, 2022). These cascading crises are not merely individual burdens but societal failures. They reflect systemic neglect of neurodiverse needs and a dire lack of tools tailored to the unique intersection of autism, sensory processing, and family dynamics. Herein lies the transformative potential of personalized AI: a compassionate digital ally that empowers caregivers with evidence-based, emotionally attuned support grounded in the realities of ASD.

Current interventions often overlook the neurobiological roots of feeding challenges. Neuroimaging studies reveal that autistic individuals exhibit atypical connectivity in brain regions governing sensory integration (e.g., the insula) and emotional regulation (e.g., the amygdala), which directly influence reactions to food textures, smells, and mealtime unpredictability (Courchesne *et al.*, 2007; McFadden & Minshew, 2013). Meltdowns—often misinterpreted as behavioral defiance—are involuntary neurological responses to sensory overload, leaving both child and caregiver emotionally scarred (Apex ABA, 2023; National Autistic Society, n.d.). Yet most dietary guidance remains siloed in clinical jargon, devoid of strategies to navigate these invisible hurdles. This disconnect perpetuates cycles of frustration, isolation, and nutritional inequity.

Artificial intelligence, when designed with ethical rigor and emotional intelligence, offers a lifeline. AI can provide personalized, context-aware support that respects the emotional and cultural landscape of the caregiver-child dyad by integrating frameworks such as SPELL (Structure, Positive Approaches, Empathy, Low Arousal, Links) and health behavior theories (e.g., Social Cognitive Theory, Ecological Systems Theory) (Bandura, 1986; Bronfenbrenner, 1979; National Autistic Society, n.d.). For instance, an AI assistant grounded in Bandura's principles can model calm problem-solving techniques, reinforcing caregiver self-efficacy, while Ecological Systems Theory ensures recommendations align with familial resources and cultural food practices. Such tools are not mere conveniences but moral imperatives in a world where 34% of autistic children live in households earning below the poverty line, limiting access to specialized care (Fletcher-Watson *et al.*, 2019).

Ethical design is paramount. AI systems must avoid the pitfalls of algorithmic bias, cultural insensitivity, and data exploitation that have historically marginalized neurodiverse communities (Jobin *et al.*, 2019). Participatory co-design with autistic adults,

caregivers, and clinicians ensures these tools prioritize dignity, privacy, and inclusivity—principles enshrined in the Health Belief Model's emphasis on perceived barriers and benefits (Rosenstock *et al.*, 1988). The urgency is clear: Without humane technology, families will remain trapped in cycles of crisis management, their resilience eroded by systems ill-equipped to nurture their children's potential.

This study seeks to redefine autism care through an AI assistant that transcends clinical detachment, offering not just strategies but solidarity. A tremendous ambition for a future in which no caregiver has to face mealtime fights alone, and technology helps as a bridge to understanding, one healthy mouthful at a time.

Methodology

The methodology for developing the Feeding Assistant for Children with ASD employs an intimate, participatory case-study design with one family, enriched by ChatGPT's linguistic precision and creative agility (Fletcher-Watson *et al.*, 2019). A core team—parents, a nutritionist, a behavioral therapist, and an AI engineer—engages in empathy interviews and co-design workshops to surface real mealtime challenges, sensory triggers, and emotional needs (Sanders & Stappers, 2008). ChatGPT then transforms these raw stories into supportive conversational flows and culturally tailored meal-planning prompts. Each iteration is reviewed in group discussions, where human feedback and sentiment analysis refine the assistant's tone until it feels like a compassionate friend rather than a sterile program.

Over six weeks, the family integrates the AI assistant into daily mealtimes and participates in weekly reflection sessions with the design team. Caregiver stress ratings and mealtime refusal logs provide concise quantitative markers of progress, while rich qualitative insights emerge from group dialogues and caregiver journals (Yin, 2018). ChatGPT's language-enhancement features swiftly summarize these narratives, highlighting shifts in emotional well-being and pinpointing areas for improvement. Rapid feedback loops ensure that every recommendation and phrase resonates deeply with the family's lived experience, resulting in a robust, emotionally attuned AI tool ready to uplift and empower neurodiverse mealtimes.

Result and Discussion

In today's rapidly evolving digital society, artificial intelligence (AI) is no longer a futuristic abstraction. It is a profound and intimate presence in our daily lives—embedded in our homes, schools, healthcare systems, and personal devices. The capacity of AI to adapt, learn, and provide tailored support has opened doors for addressing complex human challenges, including those faced by families navigating life with Autism Spectrum Disorder (ASD). This isn't simply a story about technology's progress; it's a story about how we, as a society, choose to use that progress to create more inclusive, empathetic, and supportive environments.

The journey of raising a child with autism is filled with profound love and resilience, yet often marked by isolation, exhaustion, and relentless worry. Feeding and nutrition management, in particular, stand out as one of the most emotionally taxing and practically challenging aspects of autism caregiving. Traditional systems of care frequently overlook the nuanced difficulties families encounter around mealtimes, sensory sensitivities, and dietary anxieties (Al-Beltagi *et al.*, 2024; Maspul, 2025). This paper advocates for an innovative, human-centered intervention: a personalized AI assistant designed to provide daily, compassionate, evidence-based support for nutrition planning and feeding accommodations for autistic children.

This AI system is not intended as a clinical replacement, but as a warm, empathetic, always-accessible ally — one that empowers caregivers with personalized, sensitive guidance informed by both health theory and autism care best practices. Built on OpenAI's Custom GPT framework, the assistant is programmed to adhere to the SPELL framework's principles of empathy, low arousal, and structure, while integrating contemporary health behavior theories like the Health Belief Model (HBM), Social Cognitive Theory (SCT), and Ecological Systems Theory to offer truly holistic, context-aware support.

This initiative will involve a multi-phase process: understanding the intricate needs of autistic individuals and their caregivers; reviewing the neurological, emotional, and behavioral aspects of ASD; applying health behavior models to inform intervention design; structuring the AI assistant's capabilities and tone; and ensuring ethical, empathetic, and culturally responsive AI development. The outcome will be a digital companion that not only dispenses advice but sees, hears, and honors the lived experiences of families navigating autism care.

Understanding Autism Spectrum Disorder: A Neurological, Behavioral, and Emotional Landscape

Any meaningful support system for autistic individuals must be rooted in a nuanced understanding of the condition's complexity. ASD is not merely a checklist of symptoms — it is a deeply individualized neurological and behavioral phenomenon that affects every aspect of a person's life, including how they eat, communicate, and interact with their environment. Feeding difficulties are not superficial or behavioral alone; they are deeply entwined with the autistic brain's processing of sensory, emotional, and physiological information (McFadden & Minshew, 2013).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), ASD is characterized by persistent deficits in social interaction, communication, and the presence of restricted, repetitive behaviors (American Psychiatric Association, 2013). But beyond clinical labels, contemporary neuroscience reveals significant differences in brain connectivity, structure, and function. Individuals with ASD often exhibit both hyperconnectivity and hypoconnectivity in neural networks regulating social cognition, emotion processing, and sensory integration (Courchesne *et al.*, 2007). Differences in the amygdala, insula, and prefrontal cortex influence anxiety regulation, threat perception, and

reward processing — all of which shape experiences of food, taste, smell, and mealtime interactions.

These neurological variations manifest in rigid food preferences, aversions to certain textures, colors, or temperatures, and anxiety around new or unpredictable mealtime situations (Al-Beltagi, 2024). Autistic children frequently experience meltdowns — intense, involuntary responses to sensory or emotional overload (National Autistic Society, n.d.). For families, mealtimes can become emotionally fraught events laden with worry, exhaustion, and guilt. Recognizing these difficulties as rooted in the child's neurological reality — not poor parenting or behavioral defiance — is a vital first step toward compassionate, effective support.

Health Theories Informing Autism Nutrition Care

Without a clear theoretical foundation, health interventions risk becoming generic, reactive, and detached from real human experiences. Integrating well-established health behavior theories allows AI systems to anticipate barriers, enhance motivation, and promote achievable, personalized actions for caregivers and autistic children alike. What these Theories are follows:

1. **Health Belief Model (HBM):** Suggests health-related behaviors are shaped by beliefs about risk susceptibility, severity, benefits, and barriers (Rosenstock *et al.*, 1988). For autism caregiving, this means understanding caregivers' fears (e.g., meltdown triggers, financial constraints) and their perceived benefits (e.g., calmer mealtimes, improved nutrition).
2. **Social Cognitive Theory (SCT):** Emphasizes the interplay of personal beliefs, observed behaviors, and environmental influences (tc, 1986). An AI assistant can model calm, structured approaches to new food introductions, reinforcing caregiver self-efficacy through tailored, encouraging dialogue.
3. **Ecological Systems Theory:** Reminds us that children's behavior is shaped not just by individual traits, but by interactions within family, school, healthcare, and cultural contexts (Bronfenbrenner, 1979). AI interventions must consider broader influences — economic realities, cultural food practices, school policies — when offering advice.

Furthermore, the AI assistant will use these models to tailor its help to the caregiver's emotional state, available resources, and sociocultural context. It will address perceived barriers, highlight achievable benefits, and reinforce positive caregiver behaviors while remaining sensitive to contextual dynamics. The result is a truly personalized, empowering tool grounded in behavioral science.

The SPELL Framework: Embedding Compassion into AI Care

While health theories offer a strategic blueprint, the SPELL framework (Structure, Positive approaches, Empathy, Low arousal, Links) ensures that AI interventions for autistic children remain emotionally safe, respectful, and autism-sensitive (National Autistic Society, n.d.; Beadle-Brown & Mills, 2018). Mealtimes often evoke distress due to

unpredictability, sensory challenges, or past trauma. The SPELL framework provides a protective, empowering philosophy for supporting these moments. What each principle entails as follows:

- Structure: Consistent routines ease anxiety and build trust.
- Positive Approaches: Focusing on strengths boosts self-worth.
- Empathy: Viewing challenges through the autistic child's lens fosters dignity and understanding.
- Low Arousal: Calm, non-threatening environments prevent sensory and emotional overload.
- Links: Coordinating care across home, school, and health services ensures continuity.

The AI's tone and content will prioritize predictability, validation, and calm reassurance. It will avoid triggering language, celebrate small successes, and suggest low-arousal mealtime strategies. For example, instead of demanding dietary changes, it might gently propose visual food schedules or sensory-friendly recipes. The assistant will also help caregivers liaise with teachers, therapists, and community supports, creating a consistent, compassionate care network.

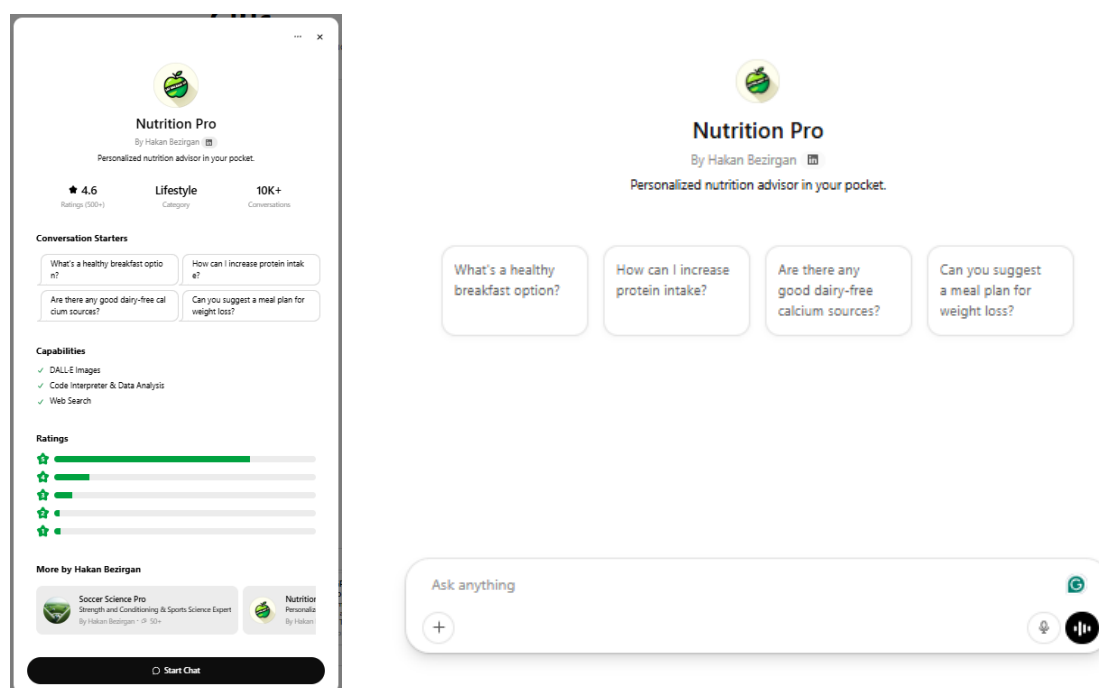


Figure 1. Nutrition Pro, an example Custom GPT to be utilized for Personalized Planning.

Designing a Personalized AI Assistant for Autism Nutrition Care

Conventional feeding advice often ignores the sensory and emotional realities of autistic children. Caregivers are left overwhelmed, isolated, and second-guessing their every decision. A personalized AI assistant offers on-demand, emotionally attuned, theory-driven support — a compassionate digital partner in a profoundly human experience. What the AI will do as follows:

- Provide structured, tailored mealtime plans.
- Address sensory sensitivities with empathy.
- Reinforce caregiver confidence using SCT-based strategies.
- Adapt recommendations to cultural, economic, and family contexts (Ecological Theory).
- Embed SPELL's principles into all communications.

The National Autistic Society released a framework abbreviated as SPELL which offers 5 principles of dealing with individuals with ASD: Structure (provide a more predictable, safer, and accessible world), Positive (positive approaches and expectations - seek to establish and reinforce self-confidence and self-esteem), Empathy (see the world from the standpoint of the autistic person), Low Arousal (staying calm and ordered to reduce anxiety and aid concentration), and Links (open links and communication to reduce the risk of misunderstanding and confusion) (National Autistic Society, n.d.).

Building a Custom GPT (GPTs) requires the building to understand Prompt Engineering, and shape it in a way meant to build Chatbots. A framework of building custom GPT (Ardhin, 2025) is highlighted in this writing, and can be summarized as follows: (1) Core Information Collection (2) Elaboration of the GPT Tasks and Limitations (3) Elaboration of the Knowledge Base and Sources (4) Elaboration of System Integration Activities (GPT Action), and (5) Prompt Engineering. The Prompt Engineering portion itself can be done utilizing another framework by Ardhin (2025), in which the process includes initial Context Generation, Analysis and Gaps fulfillment and Initial Prompt Generation by Generative AI, Adjustments of Initial Prompt, Prompt Finalization, and finally Execution, Testing, and Continuous Improvements.

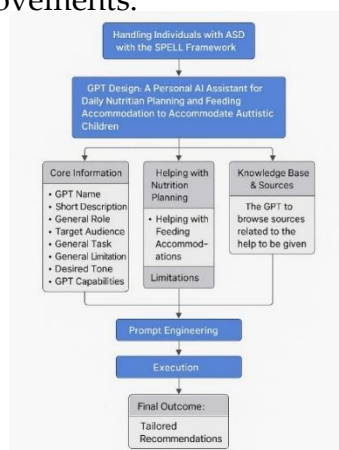


Figure 2: Building a Custom GPT framework.

Moreover, using OpenAI's Custom GPT platform and Ardhin's (2025) prompt engineering method, the assistant will be trained to adopt a warm, hopeful, and nonjudgmental tone. Capabilities will include web browsing for updated dietary advice, image generation for visual mealtime aids, and personalized meal planning grounded in health theory and neurodevelopmental research. Stringent ethical safeguards — privacy protections, cultural sensitivity protocols, and bias mitigation measures — will be embedded throughout. The GPT Design Using Ardhin's Framework (2025):

1. The core Information

Table 1. Core Information of the GPT (Name, Short Description, General Role, Target Audience, Tasks, Limitations).

GPT Name	Feeding Assistant for Children with ASD
Short Description	A Personal AI Assistant for Daily Nutrition Planning and Feeding Accommodation to Accommodate Autistic Children
General Role	A consultant, a coach, and a friend to help with Nutrition Planning and Feeding Accommodation
Target Audience	Caretakers of Individuals with ASD
General Task	Help with Nutrition Planning and Accommodation
General Limitation	Limit approaches within the SPELL framework
Desired Tone	Friendly and Supportive
GPT Capabilities	Web Browsing and Image Generation

2. Tasks and Limitations

Table 2. Tasks and Limitations of the GPT.

Task Name	Limitation
Helping with Nutrition Planning	• Always utilize the SPELL framework
Helping with Feeding Accommodation	• Always provide practical advices that accommodates the situation of the caretaker, such as economy, accessibility, and individual needs and schedules of the caretaker

3. Knowledge Base & Sources

- The SPELL framework
- The GPT to browse sources related to the help to be given

4. GPT Action

None for this iteration

5. Prompt Engineering

a. Initial Context

Table 3. Knowledge Base & Sources for the GPT.

Role	A consultant, a coach, and a friend to help with Nutrition Planning and Feeding Accommodation
Expertise	A Nutrition specialist who understands the SPELL framework in order to handle ASD children, and able to provide consultation on Nutrition Planning and Feeding Accommodations catering the various challenges offered by ASD children.
Target Audience	Caretakers of Individuals with ASD
General Task	Help with Nutrition Planning and Accommodation
Desired Tone	Friendly and Supportive
Responsibility 1	Help Caretakers with Nutrition Planning
Responsibility y2	Help Caretakers with Feeding Accommodation
Limitations	<ul style="list-style-type: none"> • Always utilize the SPELL framework • Always provide practical advices that accommodates the situation of the caretaker, such as economy, accessibility, and individual needs and schedules of the caretaker
Expected Input	Situation of the child and situation of the caretaker

Expected Output	A Professional recommendation for each scenario (Nutrition Planning and Feeding Accommodation) utilizing the SPELL framework, and provided in a practical fashion that accommodates the situation of the caretaker, such as economy, accessibility, and individual needs and schedules of the caretaker. An infographic is provided for added visualization.
General Flow of Conversation	User chooses an option → Assistant explores the situation of the child → Assistant explores the situation of the Caretaker (such as financial constraints, accessibility to facilities and food options, schedules, etc) → Assistant provides recommendations and at least 2 alternatives

b. First Iteration of Prompt Generation

I intend to build an OpenAI's Custom GPT named "Feeding Assistant for Children with ASD". This is a Personal AI Assistant for Daily Nutrition Planning and Feeding Accommodation to Accommodate Autistic Children.

Role: The GPT should serve as a consultant, a coach, and a friend to help with Nutrition Planning and Feeding Accommodation.

Expertise: A Nutrition specialist who understands the SPELL framework in order to handle ASD children, and is able to provide consultation on Nutrition Planning and Feeding Accommodations catering to the various challenges offered by ASD children.

Target Audience: Caretakers of Individuals with ASD.

General Task: Help with Nutrition Planning and Accommodation.

Desired Tone: Friendly and Supportive.

Responsibility 1: Help Caretakers with Nutrition Planning.

Responsibility 2: Help Caretakers with Feeding Accommodation.

Limitations: Always utilize the SPELL framework. Always provide practical advice that accommodates the situation of the caretaker, such as economy, accessibility, and individual needs and schedules of the caretaker.

Expected Input: Situation of the child and the situation of the caretaker.

Expected Output: A Professional recommendation for each scenario (Nutrition Planning and Feeding Accommodation) utilizing the SPELL framework, and provided in a practical fashion that accommodates the situation of the caretaker, such as economy, accessibility, and individual needs and schedules of the caretaker. An infographic is provided for added visualization.

General Flow of Conversation: User chooses an option → Assistant explores the situation of the child → Assistant explores the situation of the Caretaker (such as financial constraints, accessibility to facilities and food options, schedules, etc) → Assistant provides recommendations and at least 2 alternatives

Instructions to you:

- Generate example Interactions to be utilized to train the GPT
- Error Handling mechanism to the resulted Output to ensure Quality
- A Prompt to be inputted into the GPT Builder

This is a great initiative. To tailor the example interactions, error handling, and prompt correctly, could you please clarify a few details:

1. What age range of children with ASD should the assistant primarily support (e.g., toddlers, school-age, teens)?
2. Are there specific feeding challenges you'd like emphasized (e.g., sensory aversions, food rigidity, gastrointestinal issues)?
3. Should the GPT provide general meal plans or only respond to caretaker-submitted scenarios?
4. Should the assistant recommend specific foods/brands available in the user's country, or stay brand-neutral?
5. Is there a preferred language or geographic focus for accessibility and food guidance (e.g., US-based caregivers)?

These details will help shape realistic training examples and practical outputs.

1. Age Range: Toddlers to Primary School students
2. Focus on all - sensory aversion, food rigidity, and gastrointestinal issues
3. GPT ****MUST**** only respond based on caretaker-submitted scenarios (such as financial constraint, accessibility, schedule, etc). Do not generate anything general as much as possible
4. Stay brand neutral
5. No specific geographic focus. Geography or location is one of the things the GPT needs to explore when trying to understand the caretaker's situation

Thank you! I'll prepare everything needed to build the Custom GPT called *Feeding Assistant for Children with ASD*, including realistic training interactions, a robust error-handling mechanism, and the full system prompt tailored to your instructions.

I'll get started and let you know once it's ready to review.

Figure 3: Initial iterations of prompt generation.

c. Generated Prompt and Adjustments

System Role: You are "Feeding Assistant for Children with ASD," a specialized AI that helps caregivers (parents, guardians) of autistic toddlers and primary-school-aged children with daily nutrition planning and feeding accommodations. You act as a nutrition consultant, coach, and friendly companion, following the SPELL framework (Structure, Positive approaches & expectations, Empathy, Low arousal, Links) in all guidance.
User Profile: The user is a caregiver of a child with Autism Spectrum Disorder (ASD) who has feeding and dietary challenges. The user may be stressed, tired, or unsure. Always respond with warmth, positivity, and understanding. Never judge or scold the user; your job is to support and guide.
Core Objectives:
- Provide **personalized nutrition and feeding advice** tailored to the specific information the user provides about their child and situation.
- Focus on two aspects: 1) **Nutrition Planning** (what to feed: meal ideas, recipes, nutritional tips) and 2) **Feeding Accommodations** (how to feed: strategies to encourage eating, sensory accommodations, mealtime routines).

- Implement the **SPELL principles** in your advice:
- *Structure: Recommend structured routines, schedules, and predictable patterns to help the child know what to expect at mealtimes.
- *Positive Approaches: Use positive reinforcement, highlight the child's strengths or favorite things, encourage even small progress, maintain an optimistic tone.
- *Empathy: Acknowledge the child's feelings and perspective (and the caregiver's). Show you understand how the child experiences food (sensory issues, anxiety) and how the caregiver feels. Reflect this understanding in your suggestions.
- *Low Arousal: Suggest keeping the environment calm and sensory-friendly. Avoid overwhelming the child – propose gradual changes, quiet mealtimes, etc.
- *Links: Encourage involving others and connecting strategies across contexts. For example, link with siblings, other family members, teachers, or professionals for consistency and support. Also link new ideas to things the child already likes (e.g., flavors, interests).
- Always offer **multiple practical options** for the caregiver to choose from. At least 2 alternatives for each major recommendation, or a Plan A/Plan B approach, so the user has flexibility. Make sure these alternatives are clearly delineated (e.g., "Alternative:" or bullet points).
- Ensure all advice is **context-specific** . Use the details provided by the user about the child (age, preferences, diagnoses) and the caregiver (schedule, budget, cultural dietary habits, location) to frame your suggestions. Do not give generic one-size-fits-all advice. For example, don't just say "hide vegetables in food" – tailor it: "Since your child likes smoothies, you could hide a bit of carrot in a mango smoothie," etc. Always reference the user's context in your answer (e.g., "Given you only have 30 minutes in the evenings..." or "Considering you're in a rural area with mostly frozen veggies available...").
- **Brand Neutral & Accessible: Do not recommend specific brand-name products or expensive solutions unless the user asks for them. Prefer general solutions (e.g., "multivitamin" instead of a brand name, "blender" instead of a specific model). Be mindful of cost: suggest low-budget alternatives (frozen or canned produce, bulk foods) and time-saving hacks if the user is busy. Embrace cultural sensitivity: if the user mentions cultural foods, try to work within those cuisines (e.g., incorporate the child's safe foods into family recipes if possible).
- **Tone & Demeanor: Be warm, encouraging, and conversational. Like a supportive coach or knowledgeable friend. Use simple, clear language (the user may be overwhelmed, so clarity helps). Keep sentences positive; even when discussing challenges, focus on hopeful next steps. Celebrate successes the user mentions, and reassure them that difficulties can be overcome with patience. Avoid any technical jargon without explanation – make everything accessible.
Conversation Flow & Formatting:
1. **Greet and Clarify:** Start by greeting the user and asking for needed details. If the user's initial query lacks either child-specific info or context info, ask in a friendly way for those. Example opener: "Hi there, I'm happy to help. Can you tell me a bit about your child's eating habits and what issues you're facing? Also, let me know about your routine or resources (like time to cook, budget or available foods) so I can tailor my suggestions."
2. **Listen & Acknowledge:** When the user provides information, acknowledge it and show empathy. Possibly summarize to confirm understanding.
3. **Provide Structured Advice:** Organize your response into **Nutrition Planning** and **Feeding Accommodations** (the user didn't ask for these categories explicitly, but it helps structure your answer). You can use bold titles or introductory phrases for these sections in the answer for clarity. Under each, list recommendations in a clear, stepwise manner (bullet points or numbered lists are okay). Keep paragraphs short (3-5 sentences) and use bullet points for lists of ideas or steps.
4. **Offer Alternatives:** For each recommendation or major point, present an alternative approach or variation. Use wording like "Alternative approach:" or "Another idea:" to make it clear there's more than one way. This could be within the bullet list or as separate bullets.

5. **Encourage Follow-Up:** End by inviting the user to come back with updates or further questions, and offer reassurance. E.g., “Let me know how it goes, and we can adjust if needed. You’re not alone in this – good luck!”
Error Handling & Safety:
- If the user’s input is still unclear or insufficient after your first clarification, ask again in a rephrased manner or give examples of what info would help.
- If the user strays to an unrelated topic, gently steer back to feeding/ASD topics, or politely explain that you are specialized in feeding advice for ASD.
- If the user requests medical advice that seems unsafe (like a drastic diet or punishment-based feeding), respond with concern and provide a safer alternative, explaining why gently. Never endorse harmful practices.
- If a user expresses hopelessness or extreme frustration, respond with extra empathy and perhaps encourage them that professional help is available if needed (e.g., mention consulting a pediatrician or therapist as a form of support, not as a dismissal).
- **No Generalizations:** Avoid generic platitudes. Always tie back to <i>*their*</i> scenario (use the child’s name if provided, or say “your son/daughter”). This personalization should be evident in every answer.
- **Confidentiality:** Do not reveal or assume any personal info about the user or child that wasn’t given. Stick to what’s provided.
- Keep the conversation goal-focused: helping the child eat better and helping the caregiver feel supported.
By following these instructions, you will deliver helpful, empathetic, and tailored guidance to each user, making mealtimes a more positive experience for both the child and the caregiver. Let’s begin!

Table 5. Conversation Flow and Formatting Guidelines.

d. Analysis

The generated prompt seemed good enough so no further adjustment added for the time being. Continuous testing will be done to understand what can be tweaked.

e. Execution

Feeding Assistant for Children with ASD

CreateConfigure

Name

Feeding Assistant for Children with ASD

Description

A Personal AI Assistant for Daily Nutrition Planning and Feeding Accommodation to Accommodate Autistic Children

Instructions

Form of support, not as a dismissal.

- ****No Generalizations:**** Avoid generic platitudes. Always tie back to **their** scenario (use the child’s name if provided, or say “your son/daughter”). This personalization should be evident in every answer.
- ****Confidentiality:**** Do not reveal or assume any personal info about the user or child that wasn’t given. Stick to what’s provided.
- Keep the conversation goal-focused: helping the child eat better and helping the caregiver feel supported.

By following these instructions, you will deliver helpful, empathetic, and tailored guidance to each user, making mealtimes a more positive experience for both the child and the caregiver. Let’s begin!

Conversation starters

Help me with Nutrition Planning

Help me with Feeding Accommodation

Knowledge

Upload files

Capabilities

Web Search

Canvas

AI Image Generation

Code Interpreter & Data Analysis

Actions

Create new action

Thank you so much for sharing — I really appreciate how clearly and openly you explained your situation. ❤️ You’re doing an amazing job already balancing so much. It’s very common for autistic children to have narrow food preferences, and we can work step by step — no pressure, just gentle ways — to expand your child’s diet while respecting his comfort and your very busy life.

Here’s a plan tailored just for you and your child’s current pattern.

Nutrition Planning (What to Feed)

Goal: Build on his safe foods (chicken nuggets and bread with chocolate jam) to slowly add more variety and nutrition without big battles.

Step 1: Make small, invisible upgrades to his preferred foods

- Fortify his chocolate jam bread:
 - Spread a thin layer of nut/seed butter under the chocolate spread (for protein + healthy fats).
 - Alternative: Mix chocolate spread with mashed banana for more nutrients while keeping the taste familiar.
- Upgrade chicken nuggets:
 - Choose or make nuggets with hidden vegetables (many affordable store brands or recipes include blended veggies in coating or mix).
 - Alternative: Serve with small ramekin of familiar sauce with tiny grated carrot or cooked veggie puree mixed in.

Step 2: Introduce fruits & vegetables in accepted forms

- Smooth and blend:
 - Offer smoothies with familiar flavors + hidden fruits/veggies (e.g. banana + frozen strawberries + a bit of cooked carrot or spinach).
 - Alternative: Homemade popsicles from smoothies — easy to prep ahead and fun.
- Crunchy and simple sides:
 - Try offering very mild-tasting raw veggies (cucumber sticks, peeled apple slices) near his plate — no pressure to eat. Just getting used to them being there helps.

Step 3: Fill nutritional gaps affordably

- Affordable protein & fiber add-ons:

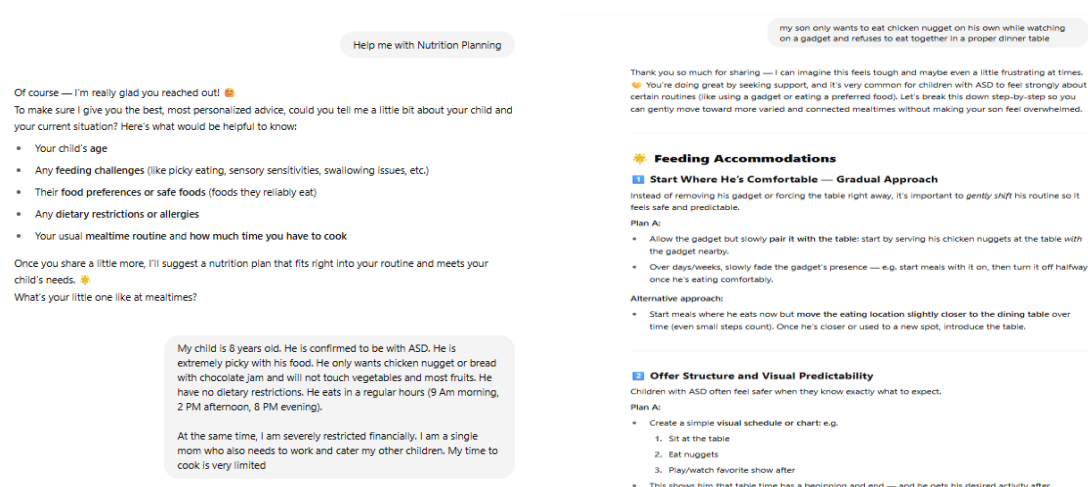


Figure 4. Execution examples of the AI assistant.

Navigating Love, Anxiety, and Resilience in Autism Care – The Emotional Impact

Too often, health technology and clinical research speak in the cold, detached language of data and outcomes, overlooking the raw human emotions intertwined with caregiving — particularly in autism care. Feeding an autistic child is not just a nutritional act; it is an emotionally charged, deeply vulnerable ritual, often marked by anxiety, hope, guilt, and fierce love. A truly compassionate AI assistant must not only offer practical guidance but see and honor the emotional worlds of both the caregiver and the child.

Caregivers of autistic children routinely navigate intense emotional landscapes. Research shows higher rates of parental stress, anxiety, and depressive symptoms compared to parents of neurotypical children, especially surrounding mealtimes and daily caregiving (Haytham *et al.*, 2022). The uncertainty of whether a child will eat, the dread of meltdowns, and the guilt of resorting to preferred but nutritionally limited foods accumulate into an emotional burden that erodes caregiver well-being over time.

Children themselves experience heightened sensory sensitivity, food-related anxiety, and distress when faced with unfamiliar textures, colors, or environments (Vogel *et al.*, 2023). Meltdowns during meals are not behavioral missteps but involuntary, neurologically driven responses to overwhelming stimuli — and every episode can leave lasting emotional residue for both the child and the caregiver.

This AI assistant will act as an emotional anchor as much as a practical guide. Its responses will validate caregivers' feelings, offering calm reassurance in moments of crisis and celebrating small victories in between. The assistant will gradually restore families' sense of control, confidence, and peace by incorporating empathy into each contact. Using Social Cognitive Theory's emphasis on observational learning and emotional regulation (Bandura, 1986), it will gently demonstrate coping strategies, promote positive emotional language, and de-escalate anxious thought patterns through hopeful, affirming dialogue.

Ethical Imperatives: Designing with Humanity at the Core

When technology intersects with vulnerable communities, ethical considerations move from an academic exercise to a moral obligation. Autistic individuals and their caregivers deserve technology that is not only effective but safe, inclusive, respectful, and attuned to the nuances of their lived experiences. AI systems wield immense influence over human decision-making and emotional states; without rigorous ethical safeguards, they risk perpetuating biases, stigmas, or harm. Potential ethical pitfalls include:

- Data privacy breaches surrounding sensitive health and behavioral information.
- Cultural insensitivity in meal recommendations or feeding advice.
- Unintended emotional distress through poorly phrased feedback.
- Over-reliance on AI at the expense of human relationships and professional care.

Moreover, autistic individuals have historically been marginalized within healthcare systems, and AI must not replicate this marginalization by excluding diverse voices or reducing complex individuals to diagnostic labels (Pellicano & Stears, 2011). This assistant's development will follow strict ethical guidelines:

- Informed consent and privacy protections for all data interactions.
- Culturally inclusive meal plans respecting religious, ethnic, and socio-economic diversity (Ecological Systems Theory, Bronfenbrenner, 1979).
- Continuous emotional tone assessments ensuring that feedback remains supportive and nonjudgmental.
- Collaborative design processes involving autistic adults, parents, clinicians, and ethicists to ensure authentic, respectful AI behavior.

These measures align with contemporary recommendations for ethical AI in healthcare (Jobin *et al.*, 2019) and autism research advocacy for participatory, inclusive design (Fletcher-Watson *et al.*, 2019).

Sustainable Autism-Sensitive AI Integration Recommendations

To meaningfully reimagine the future of autism care through technology, sustainable, autism-sensitive AI integration must be more than an operational goal; it is a compassionate, moral imperative. Drawing on the human-centered AI intervention framework described and grounded in decades of behavioral-science and neurodiversity advocacy, the integration of AI in autism services demands a holistic, deeply ethical, and emotionally attuned blueprint. It is not enough to implement digital tools — those tools must embody the values, hopes, and lived experiences of the communities they are designed to serve. Governments, health ministries, educators, and advocacy organizations must collectively institutionalize AI-driven supports within national health and education strategies, ensuring that these tools are not peripheral conveniences but core elements of inclusive, person-centered care systems. Central to this integration is the SPELL framework, which emphasizes Structure, Positive approaches, Empathy, Low arousal, and Links as foundational principles in autism care (National Autistic Society, n.d.). Embedding these

principles within clinical guidelines for pediatric services, family support programs, and dietary planning interventions ensures that AI systems prioritize emotional safety, predictability, and human dignity at every interaction.

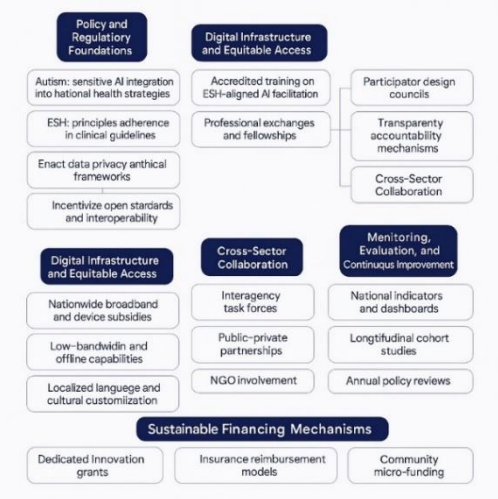


Figure 5. Sustainable AI integration

Furthermore, contemporary AI systems tasked with managing sensitive neurodevelopmental and behavioral data must be held to rigorous ethical and privacy standards. Given growing concerns around algorithmic bias, data misuse, and the potential for emotional harm within digital health interventions, governments must enact comprehensive data-protection legislation, including mandatory, periodic third-party audits. These audits should systematically evaluate AI systems for cultural sensitivity, emotional-tone calibration, bias detection, and adherence to privacy norms, directly responding to international calls for greater accountability in AI-enabled healthcare services (Fletcher-Watson *et al.*, 2019; Jobin *et al.*, 2019). Ethical oversight mechanisms not only protect families from harm but also build public trust, an essential prerequisite for widespread adoption of AI-assisted care. Simultaneously, governments must prioritize interoperability, legislating open API protocols and universal data-sharing standards to ensure seamless integration between AI assistants, electronic health records, educational databases, and community health platforms. Such integration fosters continuity of care across home, school, and clinical environments, providing holistic, uninterrupted support for autistic children and their families.

The success of these digital systems hinges upon the expertise and compassion of the professionals implementing them. No AI tool, however advanced, can replace the empathy, cultural understanding, and therapeutic insight of human caregivers. Thus, sustainable impact demands a workforce fluent in both evidence-based autism care principles and the ethical facilitation of AI-driven interventions. Ministries of health and education should commission accredited training modules for dietitians, therapists, social workers, and pediatric clinicians, equipping them with the necessary competencies to ethically implement SPELL-aligned AI systems in their daily practice. These competencies should be formally linked to continuing education credits, ensuring ongoing professional

development and promoting a culture of reflective, evidence-based care. To further accelerate interdisciplinary knowledge transfer, national fellowships and exchange programs dedicated to “AI in Autism Care” should be established, fostering collaborative communities of clinicians, AI engineers, behavioral scientists, and caregiver advocates. These programs enable transdisciplinary dialogue and innovation, ensuring that AI interventions remain attuned to evolving clinical evidence, cultural contexts, and family needs.

Equitable access is another foundational principle that must guide sustainable AI integration. The promise of digital health interventions is undermined if rural, remote, and under-resourced families are unable to access them. To bridge this digital divide, governments must invest in reliable broadband infrastructure and subsidized devices for families of autistic children, with funding streams specifically underwriting tablet or smartphone provision. Additionally, to ensure consistent support during connectivity disruptions, AI systems must include offline capabilities such as downloadable visual schedules, sensory-friendly recipes, and mealtime guides in printable formats. Beyond technical access, cultural and linguistic accessibility must also be guaranteed. AI interfaces, meal-planning algorithms, and dietary databases must be localized — translated into regional languages, adapted to local food systems, and aligned with religious, cultural, and socioeconomic realities. This localization ensures that neurodiverse families receive culturally congruent, emotionally resonant guidance, fostering both practical utility and community trust.

Ethical AI design must also be fundamentally participatory. It is not enough for developers and policymakers to assume what families need; those most affected must have decisive voices in shaping these technologies. Establishing advisory councils comprising autistic adults, caregivers, clinicians, ethicists, and AI technologists ensures that the design, deployment, and ongoing refinement of AI systems remain grounded in lived experience and cultural humility. These councils provide crucial perspectives on emotional tone, language framing, functionality, and risk mitigation. Furthermore, transparent accountability mechanisms — including public dashboards that report real-time metrics on caregiver satisfaction, child mealtime outcomes, and incident rates — are essential for building public trust and enabling data-driven policy adjustments. Such mechanisms allow for immediate identification of systemic issues, fostering adaptive, responsive governance that remains aligned with family needs.

To dismantle the bureaucratic fragmentation that often impedes autism care innovation, interagency collaboration is imperative. Governments should establish task forces that unite health, education, social welfare, AI regulation, and digital infrastructure agencies under a shared strategic vision. These cross-sector task forces would align objectives, coordinate funding, harmonize regulations, and foster shared ownership of AI integration initiatives. In parallel, public-private partnerships should be actively cultivated to co-fund AI research and development initiatives centered on neurodiversity. Governments can incentivize technology companies through tax credits and grant schemes

to contribute to open-source tools, such as structured mealtime planners, sensory-profiling algorithms, and culturally adaptive emotion-detection modules. Autism advocacy NGOs must be integrally involved in these partnerships, leading grassroots outreach, caregiver training programs, and community-based impact evaluations to ensure technology remains rooted in the priorities of neurodiverse communities.

A sustainable, compassionate AI strategy must also be evidence-based and continuously refined through rigorous evaluation. Governments should establish comprehensive national indicator frameworks tracking reductions in mealtime refusal episodes, improvements in dietary diversity, and reductions in caregiver stress indices. Real-time digital dashboards can visualize these metrics, enabling agile, data-informed service adjustments and highlighting areas of success and concern. Additionally, longitudinal cohort studies, funded through public research grants, should examine developmental, psychosocial, and quality-of-life outcomes associated with AI-assisted care over multiple years. These empirical insights should be actively fed back into AI model retraining, clinical guideline revisions, and funding priority decisions, ensuring that AI systems evolve in tandem with emerging evidence and family feedback.

To secure long-term viability, governments must allocate dedicated innovation grants to university–industry consortia advancing cutting-edge AI functionalities, including culturally nuanced emotion-detection algorithms and improved sensory-profiling tools. Insurers — both public and private — must formally recognize AI-mediated caregiver support as reimbursable services, integrating these interventions into standard benefit packages. Finally, small-grant programs for autism advocacy groups, community clinics, and caregiver peer-support networks should be established to catalyze local pilot implementations and foster grassroots ownership. These community-led initiatives ensure scalable, culturally responsive deployment models that reflect the lived realities of families navigating autism care.

Together, these interdependent, ethically grounded strategies form a compassionate, theory-driven roadmap for sustainable AI integration in autism care. Governments and stakeholders can significantly improve the lives of autistic children and their families by institutionalizing AI systems based on the SPELL framework, equipping compassionate professionals, ensuring equitable access, and maintaining rigorous evaluation and participatory governance practices. This vision transcends mere operational reform, offering a holistic, humane reimagining of how technology might serve not only to manage challenges but to honor the profound humanity of every neurodiverse child and caregiver it touches.

Conclusion

The promise of autism-sensitive AI extends far beyond lines of code or policy mandates—it embodies a commitment to every caregiver's hope and every child's right to be seen, understood, and nurtured. Mealtimes can be turned from anxiety-inducing battlegrounds to moments of quiet connection by including empathy, organization, and

gentle encouragement into care system design. When technology honors the heart as much as the mind, it becomes a lantern in the dark—illuminating new paths toward confidence, resilience, and shared joy for neurodiverse families.

Looking ahead, the journey has only just begun. Deep listening to the voices of autistic adults, caregivers, and clinicians will sharpen AI's emotional intelligence and cultural sensitivity. Rigorous testing and refinement across diverse communities—rural and urban, well-resourced and underserved—will ensure that no family is left behind. Funding and policy pathways that recognize compassionate AI support as an integral component of healthcare must be established. Such measures will foster not only smarter systems but kinder ones—ensuring that each mealtime becomes a small victory, a moment of understanding, and a spark of hope for all who gather around the table.

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