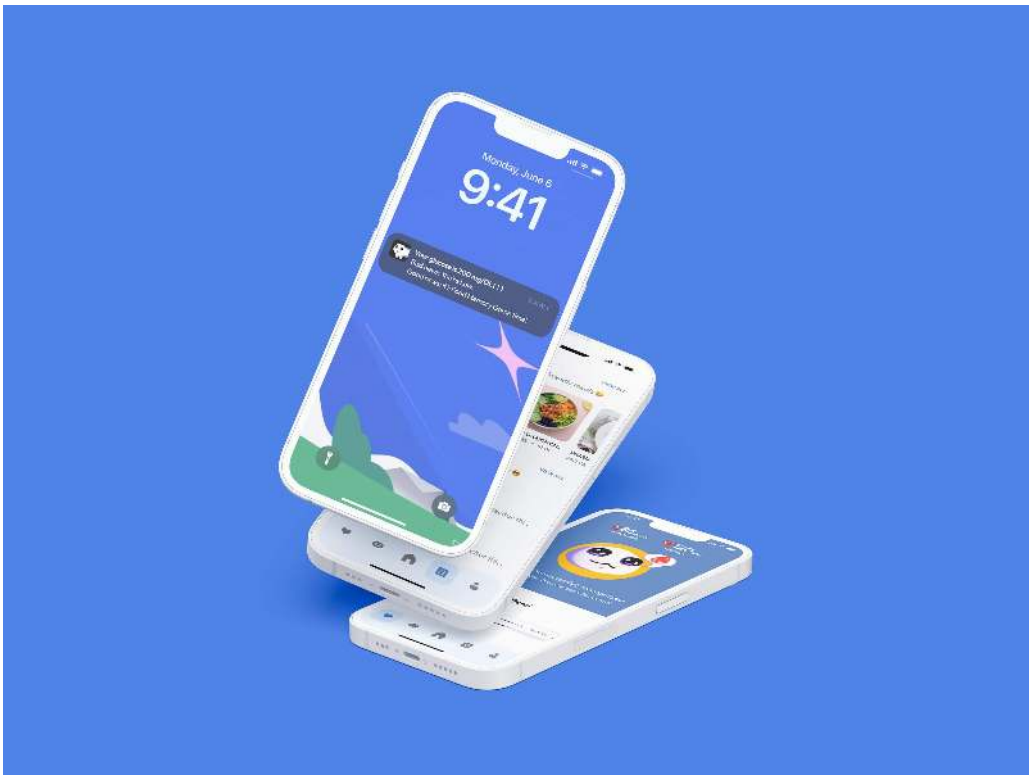
Sugar Slay—A Design Case Study

Gamifying Diabetes Management for Young Adults



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Executive Summary

In the summer of 2023, I had the privilege of contributing to a meaningful project aimed at gamifying diabetes management for young adults at Northeastern University's ReGame-XR Laboratory. "Sugar Slay" is designed to transform the ordeal of managing Type 1 Diabetes into an engaging, educational, and enjoyable experience. Through a blend of sensor integration, game development, and user-centric design, I helped create an engaging decision-support tool that empowers users to take control of their health while learning and having fun. This case study narrates the journey, the challenges faced, the user-centric approach adopted, and the design solutions crafted to make a difference in the lives of young adults with Type 1 Diabetes.

Short reflection during Northeastern University's Final Showcase for this internship: https://youtu.be/05Uvk326xr0?si=qqhislc-RJucJ69h&t=4779.

Managing Type 1 Diabetes (T1D) can be an uphill battle, especially for teenagers and young adults. The journey involves navigating a complex web of factors, from hormonal changes to emotional fluctuations. It's a challenge that demands discipline, vigilance, and jargon-filled decision-making every single day.

But what if we could transform this daily ordeal into something engaging and educational—even fun? This is where "Sugar Slay" comes

in—a gamified approach I pursued during my Summer ’23 Internship at Northeastern University’s ReGame-XR Laboratory to minimize blood glucose variability using sensor integration and gamification.

Discipline

Product Design, User Research, Game Development, and R&D Product Development (Academic)

Timeline

July 2022—August 2022

Role

Game Design (Figma) & Development (Unity + UI Builder)

For

Young adults recently diagnosed with Type 1 Diabetes

Tools

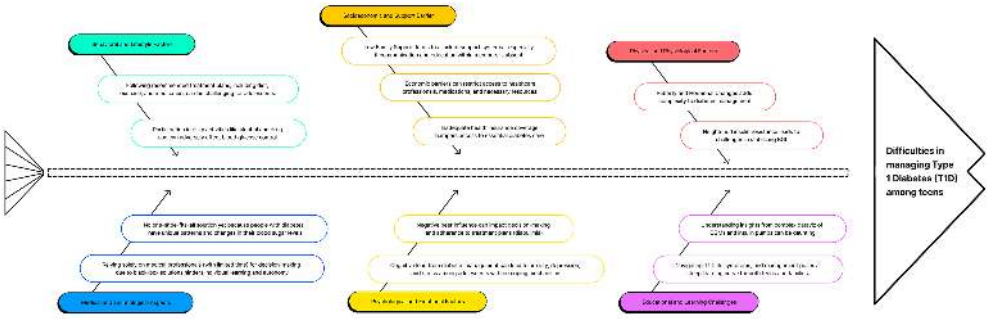
Figma and Unity (Unity UI Builder)

The Problem

Being a teenager was regretful enough.

Imagine being a teenager diagnosed with T1D. You’re suddenly faced

with a lifetime of insulin injections, blood sugar checks, and dietary restrictions. It's overwhelming. According to the Centers for Disease Control and Prevention, rates of both Type 1 and Type 2 diabetes in young people are on the rise. Adolescents with T1D face unique adherence challenges and have fewer tools specifically designed to support them. They're more susceptible to diabetic emergencies and face higher mortality rates than their non-diabetic peers.

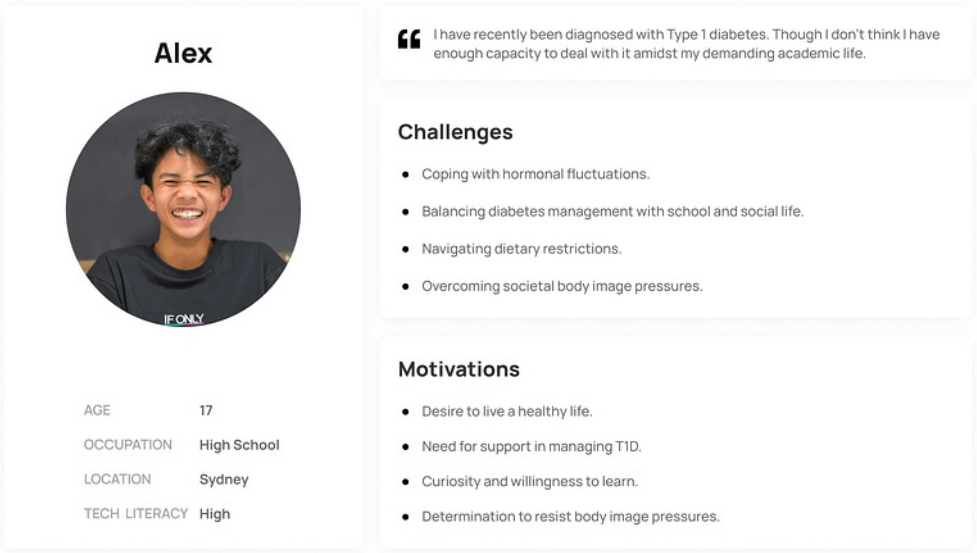


Multiple factors involved in T1D management were compartmentalized to accelerate the team's design decisions. Fishbone diagram by me.

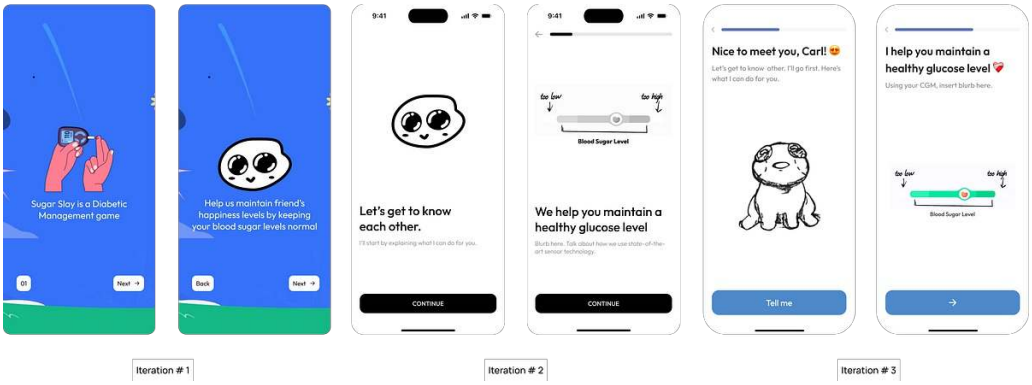
Controlling **blood glucose variability** remains the primary challenge. People with diabetes have unique blood sugar patterns, making it hard to predict and manage their insulin needs, especially during puberty when insulin resistance is high.

A continuous glucose monitor (CGM) with its companion app full of bio information and statistics.

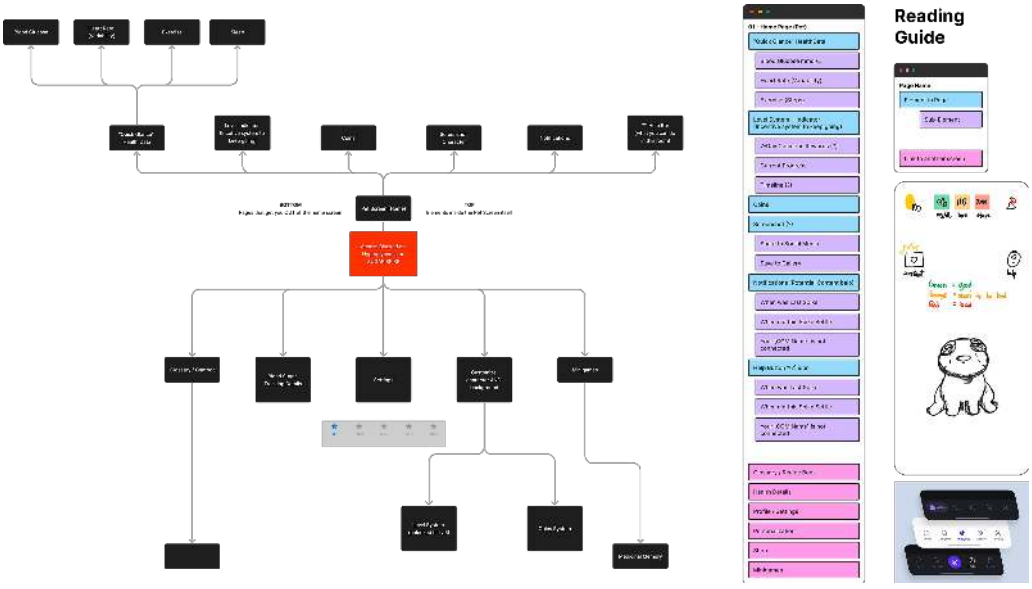
We worked with user personas to design features based on research regarding observed patterns of behaviors.



User Persona Template by [Saroj Shahi] on Figma Community



Onboarding design iterations as we became more intentional about our users.



Initial App Architecture designed by yours truly for asynchronous (comment-based) client feedback through Figjam.

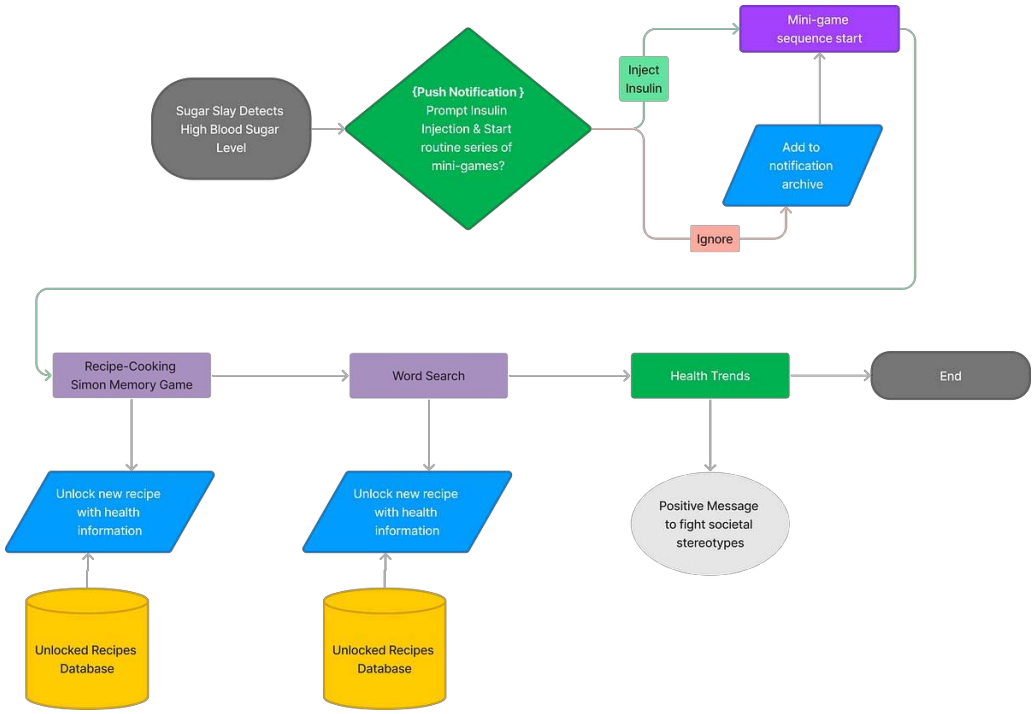
The Solution: Sugar Slay

Sugar Slay is not just a video game; it's a transformative tool that puts patients at the center of their diabetes management journey. We

leveraged sensor-based notification technology in an educational game called Sugar Slay. We designed it as an engaging decision-support tool.

Patient-users will be introduced to a virtual pet; their digital twin. They then make decisions about caring for a virtual pet based on their own sensor data. For example, a high glucose spike after a meal (based the player's real-life levels). This allows game-based simulation of potential outcomes safely, and in a manner that encourages learning, exploration, and habit-building.

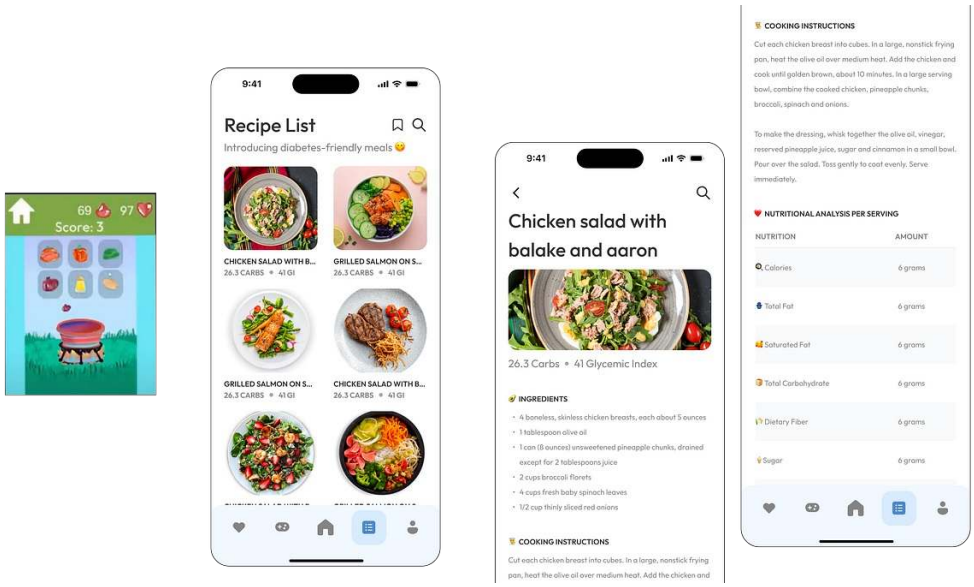
"The Autism Creature" is our game's virtual pet and mascot. Art by Molly Johnson.



Main game flow by yours truly to show the sequential mini-games and interactions within Sugar Slay, aimed at gamified learning and diabetes management skills.

Specifically, whenever blood sugar spikes, the game disables all mechanics and buttons, prompts the player to inject insulin, and starts a sequence of mini-games for a variety of health-related purposes:

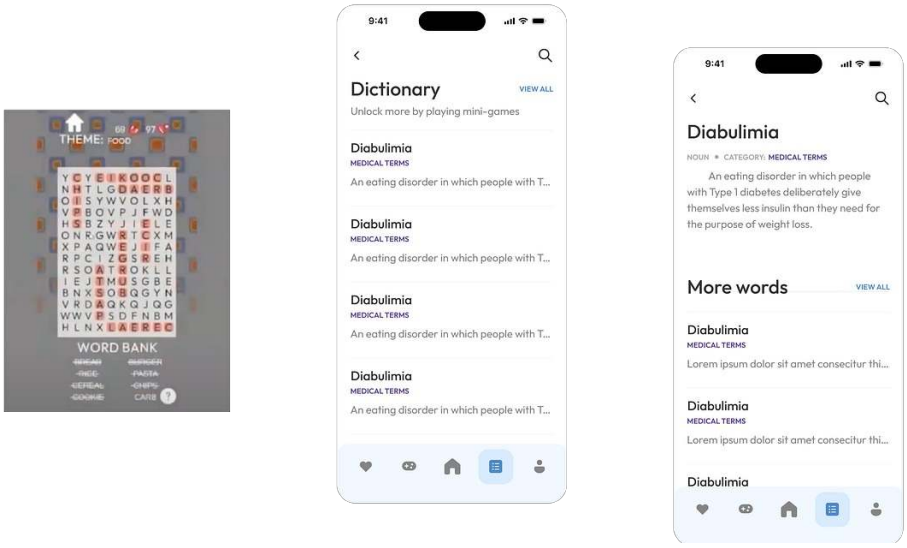
Simon Food Memory Game: This game challenges memory and cognitive skills by associating ingredients with recipes, teaching users the nutritional value of different foods. Completing the game unlocks healthy recipes tailored for diabetics, promoting better eating habits and informed food choices.



Developed game (left). Due to time constraints and unfamiliarity developers' unfamiliarity with Unity (myself included), the left-most screen was the final implementation.

Word Search: Enhancing vocabulary and understanding of diabetes-

related terms, this game encourages effective communication with healthcare professionals and informed decision-making about treatment and lifestyle choices.



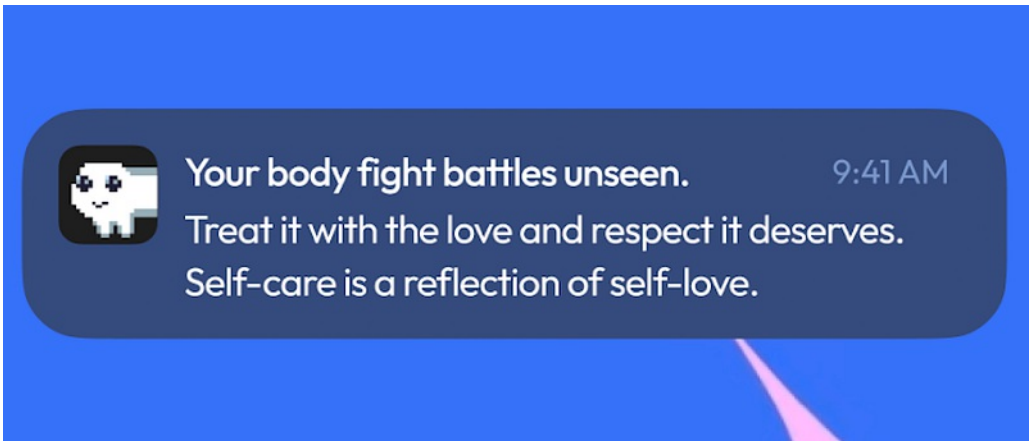
Developed game (left). Although the results were unfavorable, the (mostly neurodivergent) team fostered a positive attitude towards the crunch time and focused on work for the client's intended use (reminder: adaptability / medical research)

Transitions in between

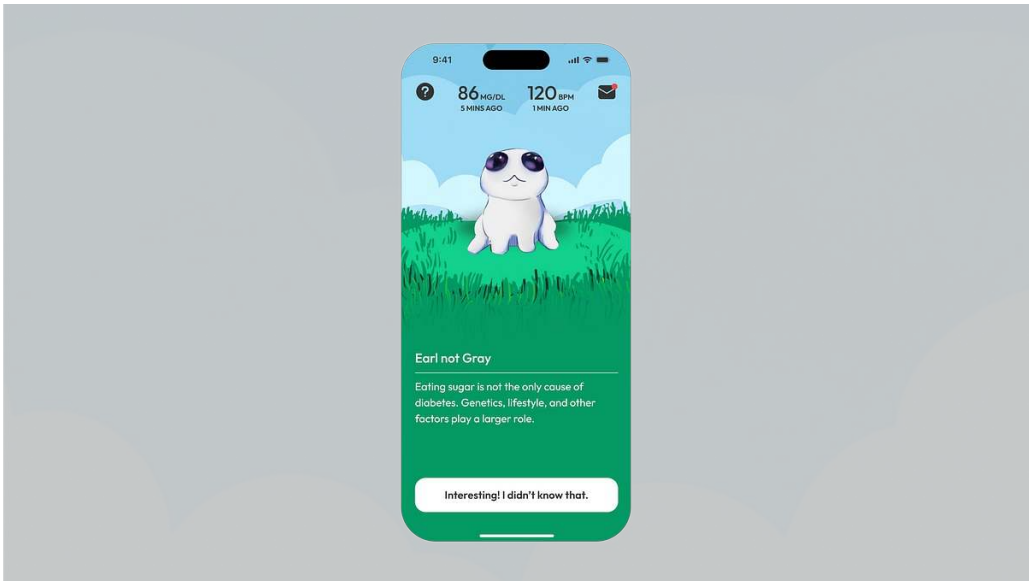
The transition between mini-games in Sugar Slay is designed to be seamless to reduce cognitive load. Upon resolving a blood glucose spike by injecting insulin, the game transitions the player to the Simon Food Memory Game, then Word Search. The completion or exit of one game leads the player to the next, with a brief interstitial screen explaining the next game's objective and its relevance to diabetes management. This approach maintains a flow, ensuring players don't feel overwhelmed while transitioning between different game environments.

Snake Game for Insulin Management: Addressing the drowsy effects of insulin, this fast-paced game keeps players mentally alert, reducing the risk of hypoglycemia-related drowsiness. Reduces cognitive load from previous games by being the "fun and mindless" game, refilling goodwill reservoir.

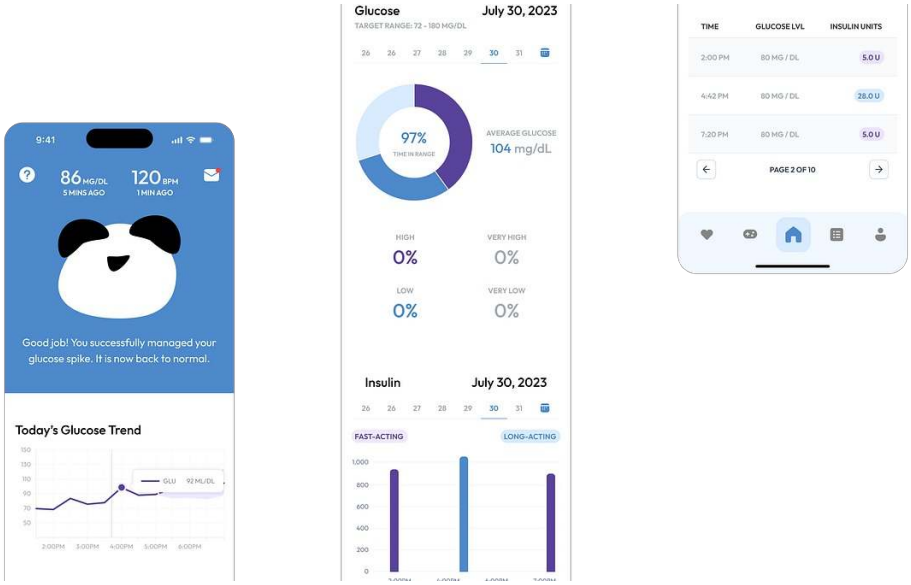
Dealing with Diabulimia: Sugar Slay counters harmful practices like diabulimia, where patients intentionally miss insulin shots to lose weight, by integrating body-positive quotes. These quotes appear randomly via push notifications, promoting a positive mindset and combating societal pressures related to body image.



Challenging Cultural Assumptions: By providing scientifically sound health facts during idle moments on the home screen, Sugar Slay challenges cultural assumptions about diabetes, encouraging critical thinking.



Health Trends Page: Displays the user's diabetes management progress.—Offers insights into their performance and achievements. It also provides a motivational message to uplift users and improve self-perception.



Sugar Slay's Health Trends Page

This user flow ensures a seamless and engaging experience while effectively managing diabetes and maintaining user engagement throughout the journey.

With Sugar Slay, the often overwhelming task of managing blood glucose levels turns into an enjoyable and educational experience. It empowers users to take control of their health, make informed decisions, and improve their overall well-being via the mini-games habit-builders.

User Testing Insights

During the two user testing phases (hosted by Northeastern Uni), valuable insights were gathered. These led to crucial improvements in the Sugar Slay app:

Enhanced Engagement Through Storytelling:

- Feedback revealed that users found it challenging to commit to taking care of the virtual pet within the app.
- To address this, we introduced a compelling narrative around the virtual pet's journey, creating a stronger emotional connection for users.
- The addition of a captivating story improved user commitment and motivation to manage their diabetes effectively.

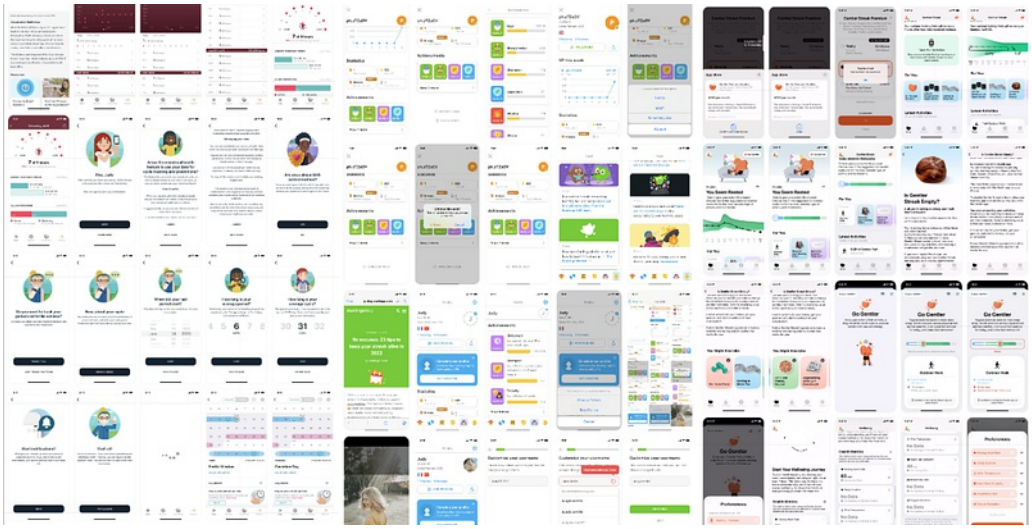
Improved Onboarding Experience:

- Users expressed difficulty in understanding how to utilize the app's features effectively during the initial setup.
- To simplify the onboarding process and enhance user comprehension, we integrated Apple's pre-existing Health Kits and Research Kits.
- This iOS-exclusive feature streamlines data collection and provides users with a smoother introduction to Sugar Slay.

My Accomplishments During the Internship

During my internship at the ReGame-XR Laboratory, I had the privilege of contributing significantly to the Sugar Slay project. Some of my key accomplishments include:

- **Game Design and Medical Integration:** I led the design and development of the Sugar Slay application, aimed at enhancing blood glucose level (BGL) management for teens with Type 1 Diabetes. By incorporating real-world medical concepts, I transformed sensor technology like Continuous Glucose Monitors and Insulin Pumps into engaging gameplay mechanics.
- **Unity Proficiency:** Despite having zero knowledge initially, I quickly learned to utilize Unity as the primary game engine. I implemented the user interfaces I designed on Figma with UI Builder.
- **UI/UX Design:** I took charge of UI/UX and developed design patterns, color schemes, and accessibility guidelines. Figma served as my design toolkit, allowing me to create mockups, wireframes, and prototypes for game screen development.
- **Time Management and Adaptability:** Managing my tasks and time was crucial, especially since I was concurrently working on Project #1 as the sole game developer (Unreal Engine). I demonstrated adaptability by swiftly learning new tools and technologies.
- **Research and Documentation:** I conducted extensive research, studying over 100 screens from existing medical apps and researching topics including game design, diabetes management, UI/UX best practices, and more, ensuring that Sugar Slay was grounded in evidence-based practices.



I used mobbin.com. Studies applications included Google Fit, Duolingo, and Gentler Streak.

Future Recommendations

As Sugar Slay continues to evolve, there are several exciting avenues for future enhancements and features:

Integration of ChatGPT for Personalized Guidance:

- Consider incorporating a ChatGPT bot into Sugar Slay to provide users with personalized guidance and information.
- This AI-powered chatbot could assist users in answering questions, offering medical advice, and providing support, reducing the reliance on busy healthcare professionals or parents.
- Users may feel more comfortable seeking answers from a chatbot, addressing potential concerns about feeling self-conscious or unintelligent when discussing their condition.

Enhanced Educational Content:

- Expand the educational content within Sugar Slay to include more comprehensive

resources about diabetes management beyond recipes and terminologies.

Community and Peer Support:

- Create a community feature within the app, allowing users to connect with peers facing similar challenges.
- Peer support can foster a sense of belonging and facilitate shared learning experiences among teenagers and young adults managing T1D.

Advanced Data Analytics:

- Implement advanced data analytics to provide users with detailed insights into their diabetes management progress.
- Offer personalized recommendations based on individual data, encouraging healthier habits and better control of blood glucose levels.

It's worth noting that a previous idea for integrating a ChatGPT bot into Sugar Slay was presented, but due to budget constraints, it was not implemented at that time. However, revisiting this concept in the future could greatly enhance the app's user experience and support capabilities.

My journey during this internship was both enriching and rewarding. It allowed me to make a meaningful contribution to the development of Sugar Slay, a project with the potential to improve the lives of teenagers with Type 1 Diabetes.

During my internship, I effectively managed my time, enabling me to be promoted and work on a second project concurrently. This video game aimed to empower non-speaking children with autism to communicate via Augmented Alternative Communication (AAC).

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By Carl Kho on October 9, 2023.

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