JollyPod

Team

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Design - Janette Cheng

Value Proposition

Helping children manage diabetes in a fun and engaging way, in turn reducing stress and anxiety over managing their condition.

Problem and Solution

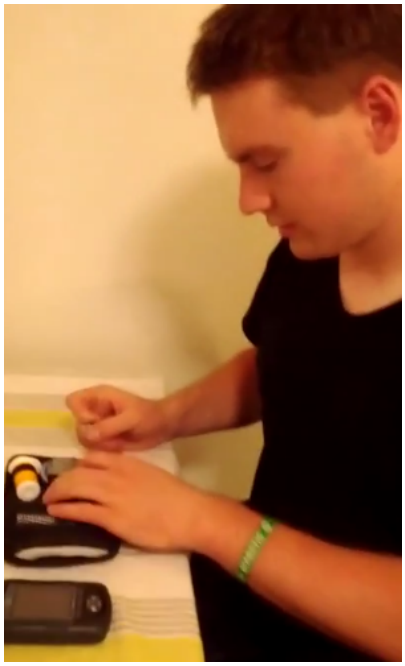
For many children with diabetes, managing their condition is very scary and daunting. Diabetes care can be a flurry of self-administering insulin shots, pricking and testing blood, visiting the doctor, etc. Our hope is that by minimizing these fears, children can be more relaxed and learn more in depth on how to manage their health better. Currently, many children manage their diabetes through a Personal Diabetes Manager (PDM), which is a device that tests blood glucose, communicates to an insulin reservoir, and visualizes blood glucose data. Currently PDMs are not user-friendly, and definitely not kid-friendly as the interface is not intuitive. We are improving the Personal Diabetes Manager by designing a kid-friendly interface that integrates reminders, metrics, educational games, and positive reinforcement.

Contextual Inquiry Customers

We talked to a 21 year old diabetic male Stanford student, his mother, and a 20 year old diabetic female student. The male Stanford student reflected on his growth since diagnosis and what resources he wishes he had. He is also currently using the product (the OmniPod) we are looking to redesign. His mother provided the perspective of a parent of diabetic child and the main client in purchasing diabetes care supplies. The female Stanford student was diagnosed relatively early (at the age of 6), and thus presented the unique perspective of someone who had diabetes as a young child. She also uses a different system to manage her diabetes, so we were interested in examining the pros and cons of her system versus those of the OmniPod system.

Harshitha has known the male Stanford student for a while and was inspired by his story to propose this product, and by extension, knows his mother. We asked them to be interviewed. The female Stanford student was recruited through a Facebook post on the Class of 2016 page.

The male Stanford student has had diabetes for 9 years and has been on the OmniPod system for 5 years. He hails from a small town in Western Kentucky and has to drive two hours away to Vanderbilt Medical Center to visit the doctor every few months. He has to manage his diabetes around activities like golf, tennis, hiking, etc. He is currently a senior studying Computer Science. Harshitha interviewed him in her dorm at Stanford (see Figure 1-1).



(Figure 1-1)

The male Stanford student's mom still lives in Western Kentucky and is 49 years old. She was a flight attendant for American Airlines for a while before she decided to focus solely on her kids. She is a homemaker and has one other child, a daughter, who is 3 years younger. She is concerned that her daughter might also get diabetes since there is a genetic component to this disease. Harshitha interviewed her in the mom's house.

The female Stanford student was diagnosed with diabetes when she was 6 years old, and is now 20. She administered insulin through shots for two years after she was diagnosed, but now uses a system consisting of a continuous glucose monitor and

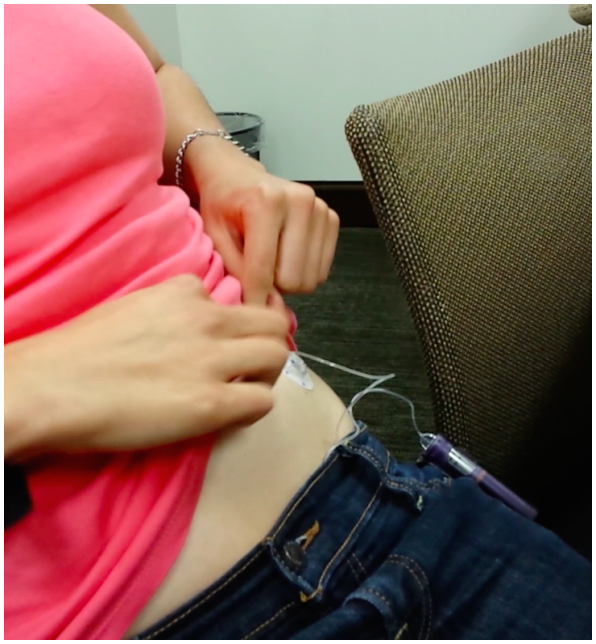
glucometer that communicate wirelessly with an automatic insulin pump (from Medtronic). Henry and Janette interviewed her at Arrillaga Dining Hall, a common dining hall on campus (see Figure 1-2).

(Figure 1-2)

Both Stanford students can successfully test their blood glucose, count carbs on their plate, and self-administer insulin.The male student's mother knows how to test his blood glucose and make suggestions for administering insulin. She also played a major role in teaching her son how to manage diabetes, and currently researches on the cutting edge treatments that are available to diabetics.

Contextual Inquiry Results

We learned that while diabetes is a very scary and daunting disease, the people who have it, with the right resources and familial support, can manage it pretty well. We became aware of a different method to administer insulin, which is a continuous glucose monitor insulin pump. This method particularly offers tighter control of blood glucose as the device collects blood glucose data without the patient's intervention. However, the student that uses this system did express that the beeping of the continuous glucose monitor can become irritating, and that she often ignores it if she is feeling fine.



Insulin pump from medtronic that communicates wirelessly with continuous glucose monitor and traditional glucometer.

Continuous glucose monitor

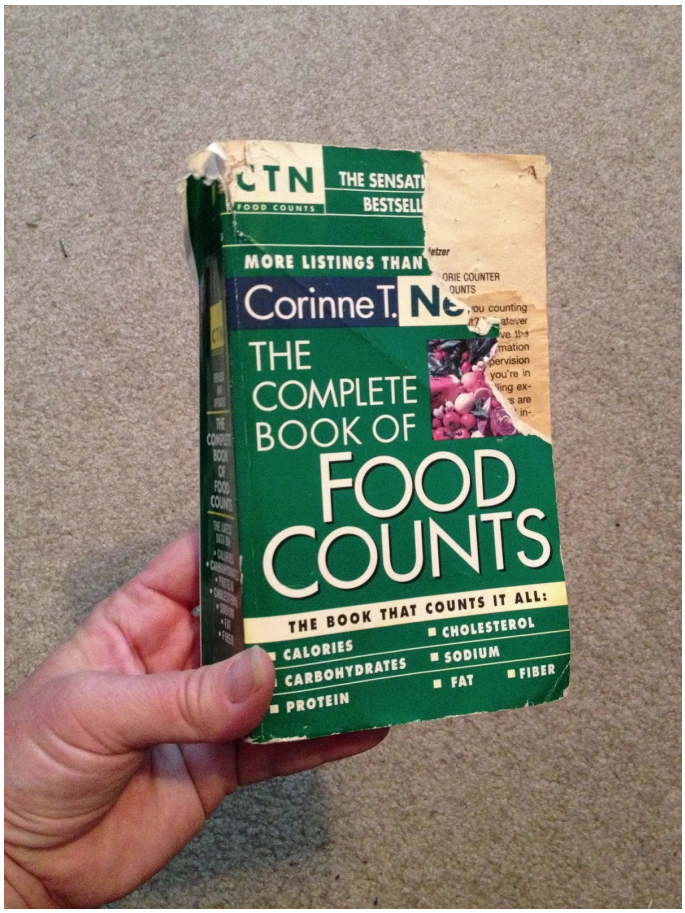
We also became more aware that decisions about what system to buy and how to manage blood glucose do not happen in a vacuum. The parents of diabetic children can play a significant role in making financial as well as health related decisions. Even now, the mom of the Stanford student keeps a drawer in her house solely dedicated to diabetes supplies such as extra insulin pods and PDMs, needle tips, insulin pen, etc. With this in mind, we either need to consider adding features for parents in our app or have a companion parent app.

Drawer of diabetes supplies, including a personal diabetes manager, glucose test strips, extra insulin pods, needle tips, and an insulin pump.

We learned that while current systems used by diabetics are good for measuring blood glucose numbers and administering insulin, none of them offer constructive feedback on how the diabetic can improve his or her lifestyle. For instance, the OmniPod PDM visualizes the data as a scatter plot of blood glucose levels over time of the day. Furthermore, it gives statistics such as 7 day average, 30 day average, 90 day average, etc. These features give an overview of trends, but nothing constructive to work off of like “Look, you always wake up high. That’s because you ate too many snacks before sleeping and didn’t bolus”. We feel that at one point, numbers are just numbers, and that we need a way to make these numbers more meaningful to diabetics.

The male diabetic student, who uses the OmniPod system also told us that counting carbs was imprecise and can often lead to out of range blood sugar numbers. This, according to the female diabetic student who uses the Medtronic system, can cause anxiety, especially if you are a child who is just beginning to count carbs without the aid of your parents. On a day to day basis, both diabetics use heuristics, shortcuts they have learned over the years, to instantly calculate what they ate after a meal. In her interview, the mother of the male student brought out a well-worn carb counting book. I

noticed that her son does not carry around such a book and relies on his heuristics to manage his carb counting and insulin intake. Perhaps, in our app, we can include a database of carb counts for food, so that people can easily look up and add to their carb count what they ate in order to bolus for insulin.



We acknowledge one of the risks of gamifying something or portraying it in a humorous light is that we underemphasize the seriousness of having Type 1 Diabetes. One of the students conveyed to us he got irritated by pamphlets that say something along the lines of “Diabetes is a new fun adventure”. He also added that it was condescending. With this in mind, we hope to have an app that is kid-friendly, but is solely dedicated to educating the child about his or condition in a respectful, serious way.

Task Analysis Questions & Answers

1. Who is going to use the system?

    Children who have recently been diagnosed with diabetes.

2. What tasks do they now perform?

    Currently, people with diabetes have to regularly check their blood glucose, count carbs when they eat, administer insulin (either with needles or a pump), and replace insulin when they run out. They also have to keep track of all of their supplies and make strategic decisions about when and what they eat.

3. What tasks are desired?

    A fast and easy way to count carbs would be useful. Another desirable task is a precise and fast way to keep track of blood glucose trends and administer insulin.

4. How are the tasks learned?

    Many people with Type 1 Diabetes are diagnosed early on, so they learn a lot from their doctors and parents. The female student we interviewed actually still goes to her pediatric endocrinologist. Her situation is also interesting because she was diagnosed so early, she does not remember explicitly learning the tasks. At the beginning, her parents did a lot of the tasks for her. Then, as she grew older, she assumed more responsibility. The male student was diagnosed when he was 14 years old, so he remembers using things like flash cards and a reference book to learn how to count carbs.

5. Where are the tasks performed?

    Everywhere—diabetics must check and maintain their blood glucose wherever they go, whether it is school, work, home, the gym, etc.

6. What's the relationship between customer & data?

    Customers, as well as their doctors and parents, must keep track of long term trends. For example, the female student we interviewed mentioned how she used to go to the endocrinologist every three months to have her average blood glucose level tested and recorded (A1C test). Poorly managed diabetes can lead to capillary damage, which can cause symptoms like loss of vision or deterioration of the fingertips, so it is important to record these long term metrics.

7. What other tools does the customer have?

    There are already systems and tools from companies like OmniPod and Medtronic that utilize wireless communication between devices and glucose pumps. There are also traditional ways to learn skills like counting carbs with pamphlets, flash cards, and books. Diabetics can also look things up online through a search engine when they have questions.

8. How do users communicate with each other?

    There are some communities online where diabetics can connect (ex: Type 1

Diabetes groups and pages on Facebook). We have also heard of diabetes camps and informal diabetes groups that meet in person, allowing diabetics to connect and share experiences.

9. How often are the tasks performed?

   Blood sugar is tested 6-8 times a day -- before each meal, after physical activity, anytime the patient feels ill

   Bolusing for each meal or snack is done ~6 times a day.

   Users count carbs for each meal or snack, ~3-5 times a day.

10. What are the time constraints on the tasks?

    Diabetics have to test for blood glucose before every meal and before sleeping. They must also bolus for insulin immediately before/after eating. Testing blood glucose and bolusing are not time consuming - only a few minutes total for testing, counting carbs, and bolusing.

11. What happens when things go wrong?

    If blood glucose is extremely low or high, patient may become unconscious and must be sent to the hospital.

    Guardians must know how to use glucagon pen to increase blood glucose when patient is suffering from low glucose. If they are unresponsive, then 911 must be called.

The 3 tasks we want our application to support are:

1. Checking blood glucose (simple)

   This is a simple task that takes less than a minute for people who have had diabetes for several years, like the diabetics we interviewed. It is also done very frequently (7-8 times a day), usually before meals, before bed, and whenever one feels ill. Because this task needs to be done the most often, our app will focus on streamlining the process of checking your blood glucose and taking the necessary actions afterwards (i.e. having a snack or administering insulin).

2. Counting carbs/learning to count carbs (moderate)

   Counting carbs requires quite a bit of practice. In fact, it was one thing we found caused anxiety in diabetics because it can be inaccurate and currently involves looking up/memorizing of the number of carbohydrates in different foods. Therefore, we would like to teach the user how to count carbs through the use of games to make it feel less like brute memorization. We would also like for there to be a quick and simple way of tallying and recording the number of carbs in each meal.

3. Administering insulin (complex)

   Administering insulin is complicated because you have to consider a variety of

questions such as: “What have you eaten?”, “What was your blood glucose previously?”, “What activities will you be doing later?”, and finally “What amount of insulin do you need?”. We want to allow the user to be able to easily and quickly compile the answers to these questions and to get an accurate suggestion for the units of insulin they need.

Three Best Application Ideas

1. Diabetes Network

   One application we thought of was a social network for diabetics that would focus on sharing tips, victories, and struggles. Bonding with other diabetics can relieve stress, which is significant for diabetes patients and is something they have already expressed some interest in. However, many social networks already exist online (Facebook, for example, has a page devoted to Type I Diabetes memes), so the idea itself is not particularly interesting or novel.

2. Gamified, Integrated Diabetes Management System

   Another application we thought of was an integrated diabetes management system, using games as a method of teaching common tasks and encouragement. The application would be an end-to-end system that helps users measure their blood sugar, estimate carbohydrates, and administer insulin. From our interviews, we saw that many of these tasks are separate and disjointed in current insulin pumps/systems. Also, we discovered that tasks such as counting carbs are stress-inducing, especially in those recently diagnosed. By making a game out of these daily tasks, we thought we could reduce the anxiety and uncertainty that comes with this condition. This is the application we selected.

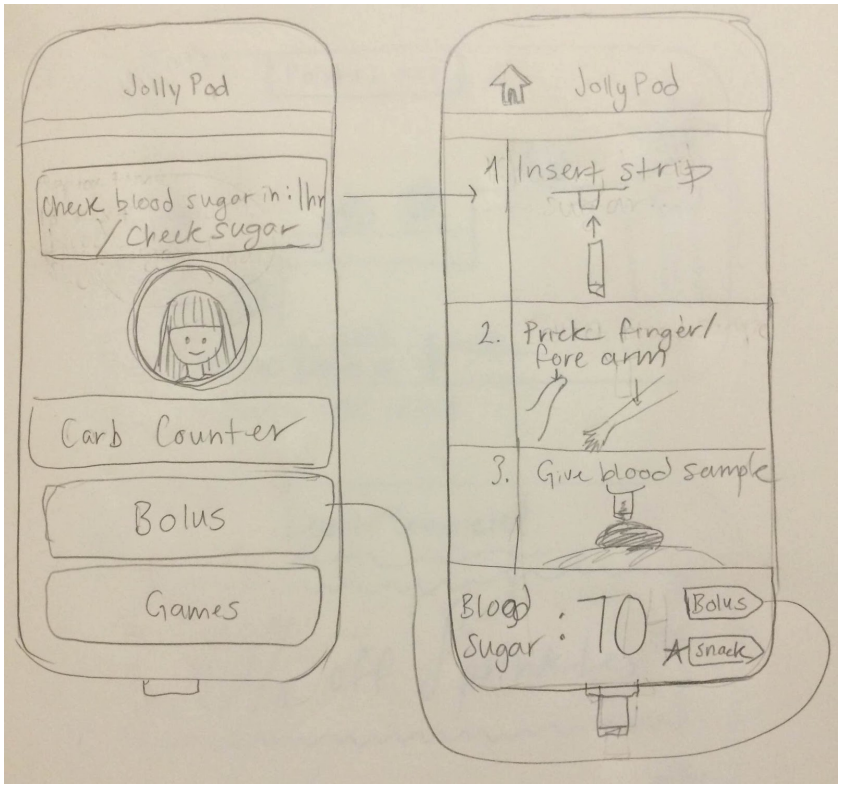
3. Artificial Pancreas Monitor

   This would be a highly advanced system that constantly monitors (tests blood sugar) and automatically administers insulin without input needed from the user. Statistics of blood sugar, trends, and recommendations would be projected onto the user’s forearm, or would appear in a HUD.

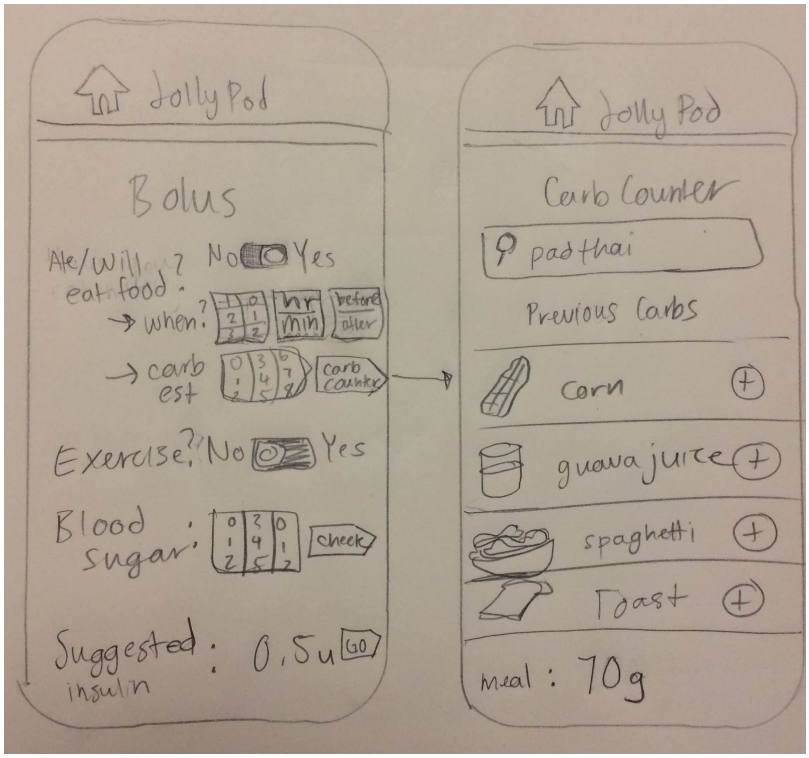
	Significance	Feasibility	Interest
Diabetes Network	Yes. Social encouragement is a strong motivator	Yes. Social networks are in common use and would be easy to adapt/change	No. Would probably not be sufficiently interesting

Gamified, Integrated Diabetes Management System	Yes. Would improve systems currently in existence	Yes. All technology is currently possible. Would just need thoughtful redesign/integration	Yes. Would be both possible, and the gamifying concept is interesting
Artificial Pancreas Monitor	Yes. Would be the ideal end goal	No. Would not be feasible in the near future. Aiming to work on something possible in several years	Yes. Interesting problem of a user interface for a non-existent technology

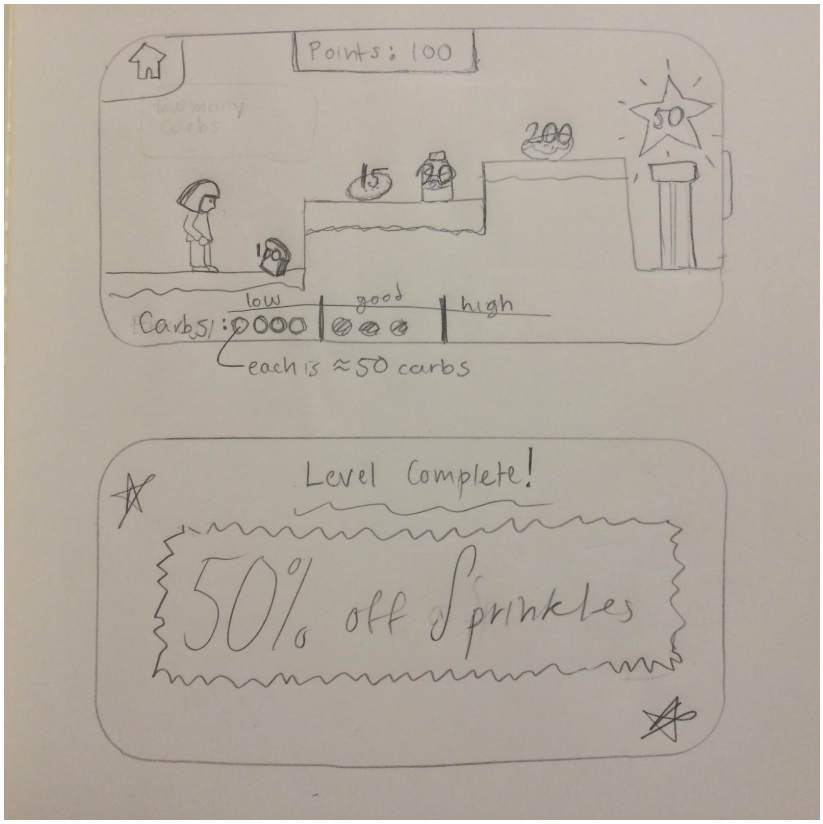
Sketches



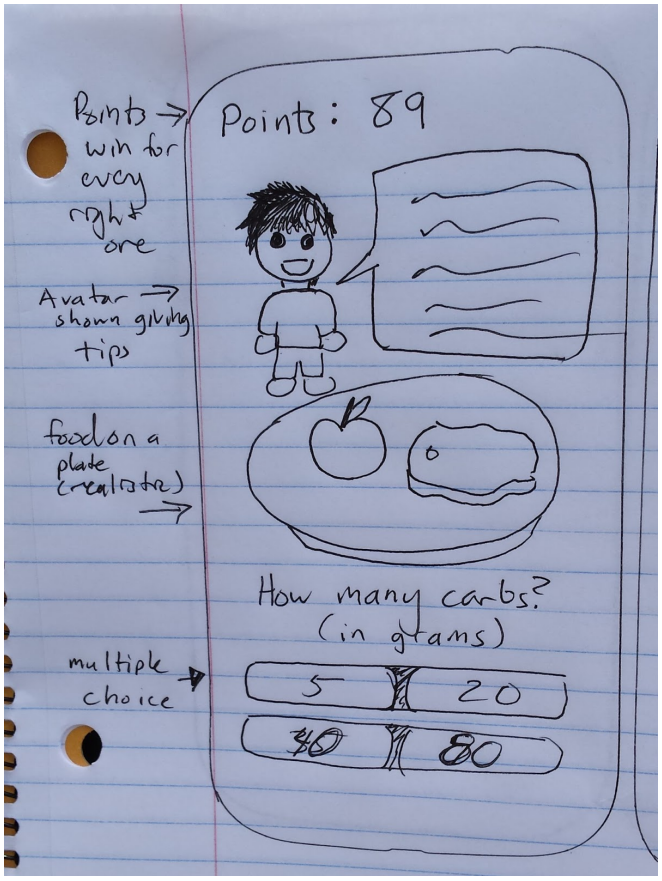
Home screen and screen to test blood sugar - Janette



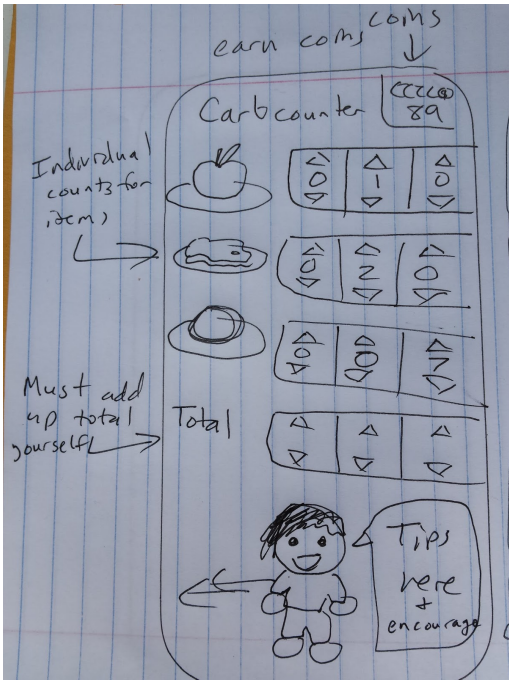
Screens for bolusing and counting carbs - Janette



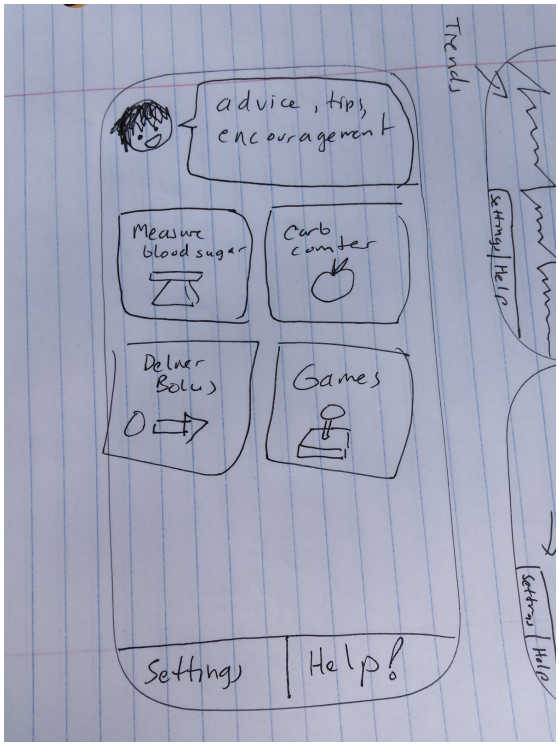
Mario Brothers style game - Janette



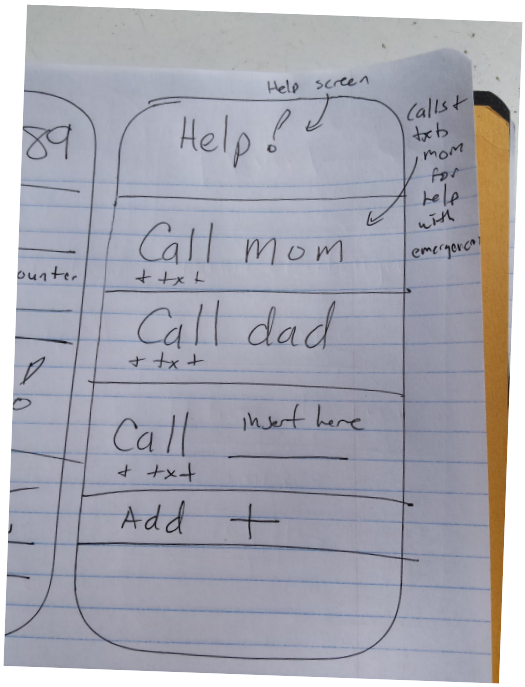
Carb Counter Game - Henry



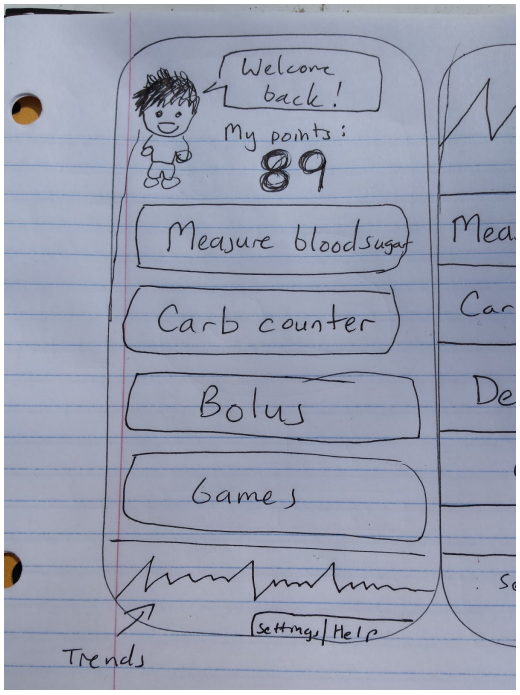
Carb Counter Redesign - Henry



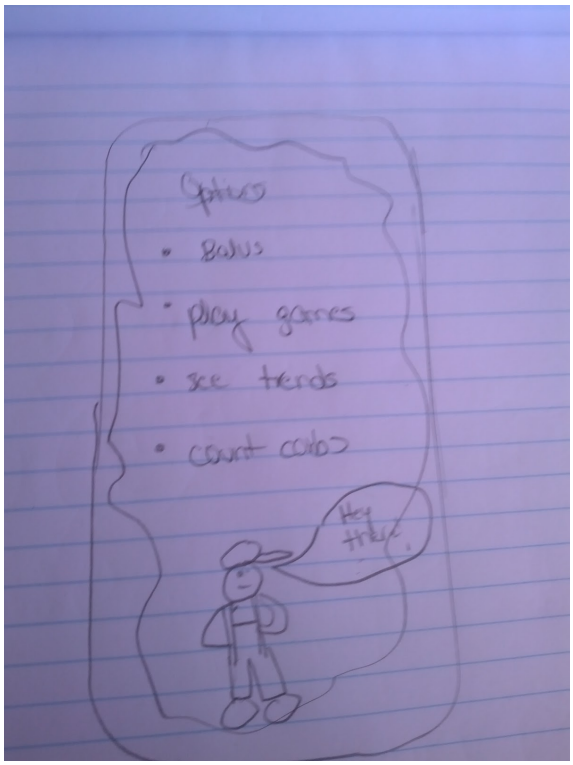
Main Menu - Henry



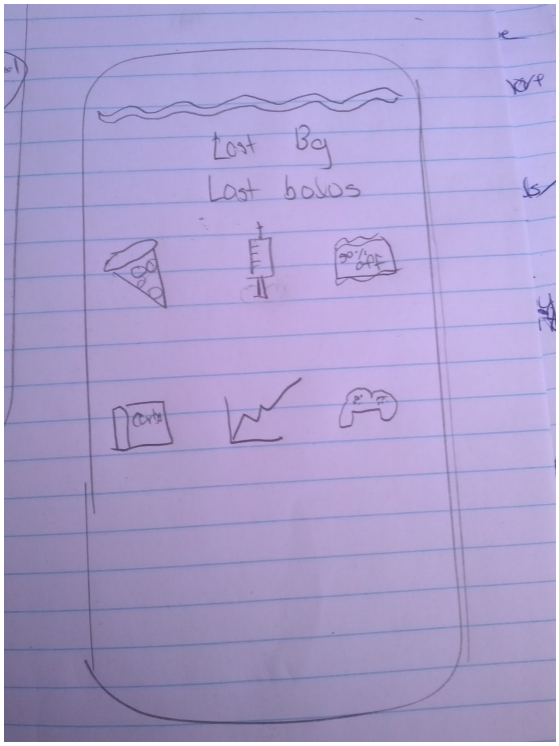
Help/emergency contact screen - Henry



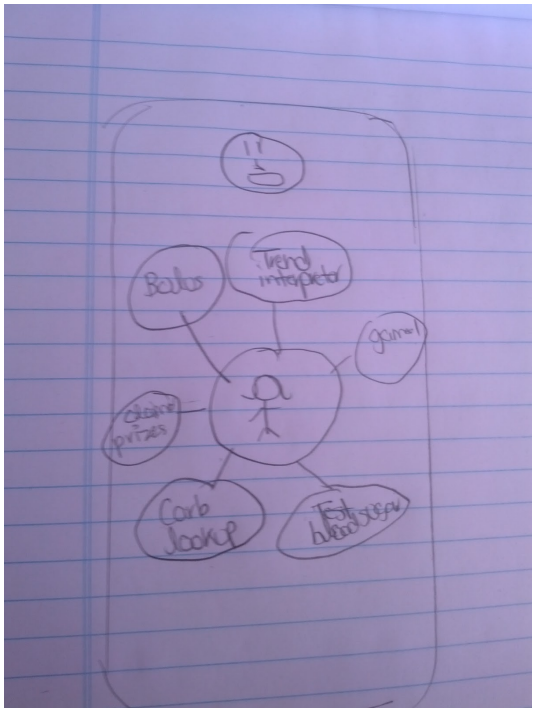
Main Menu redesign- Henry



Main screen - Harshitha



Trends and records with icons - Harshitha



Navigation organized as visual web - Harshitha