

## Prototypes for Reducing Vaccine Anxiety

The most anxiety-inducing visits at Sears Pediatrics are vaccine appointments. For babies and young children under 3, it is usually easy to distract them and vaccine administration goes smoothly. For children in the 3-6 age range however, vaccines are often met with screaming and great resistance, since they're more aware of what's happening. For my semester project, I am looking to reduce vaccine anxiety for children before and during vaccine appointments, especially for those who are within this 3-6 age range.

For this problem, I ask the following questions:

*How might we reduce patient anxiety during vaccination appointments, to lessen the possibility of children developing lasting needle phobias? Furthermore, how might we develop a specialized solution that would be accessible to smaller pediatric offices, and not just hospitals with more employees and larger budgets?*

### Design Criteria

To approach this problem, I am exploring a customizable pre-treatment activity that can educate children on the benefits of vaccines in an age-friendly way, and reduce nervousness children may have about their appointment. I am also creating a distraction activity in a digital format that can be used during vaccine administration.

My pre-treatment design will ideally adhere to these goals:

1. Can be quickly set up and customized by the doctor to fit their individual practice.
2. Will have the visual friendliness and feel of a children's book.
3. Can be easily accessed by the parent, even without the doctor's direction.
4. Will educate on why the treatment or vaccine is helpful, and what it does.
5. Will effectively reduce nervousness about the treatment, or at least leave the child with some reassurance about the process.

My distraction design will ideally adhere to these goals:

1. Accessible to smaller pediatricians, not just hospitals that have a larger technology budget.
2. Be visually interesting and appealing for all ages, but especially children.
3. Set up as quickly and smoothly as possible to fit within the vaccine appointment timeframe (and to cause as little anticipation distress for the child as possible).
4. Low activity on the patient end, so that it will require little to no body movement that would hinder the vaccination process.
5. May involve parent participation / direction to provide additional comfort to the child.
6. Must be visible to the child while the vaccine is being administered.
7. Must not get in the way of the pediatrician to ensure safe administration.
8. Won't be confusing to parents or children, and will require little to no explanation that would take up time during the appointment.
9. Will incentivize young children to remain lying on their backs, for Dr. Sears' practice.
10. Fun and effectively distracting for the child to reduce fear and pain perception.

### **Design Process**

Since I am working with a young age group, I decided that "bags of stuff" would be the most intuitive design method that would not require writing. The technology I'm making will not be feature-rich since it is used for such a brief amount of time, so I prioritized getting input on the visual art and design aspects from children. It is important to create characters and art that will be immediately appealing to children of this age group.



For the design session I conducted, the children answered the question, "How could you help a friend who is sad or scared far away?" and were prompted to make something that could comfort them in their place. I worked with a small group of children so they influenced each other's ideas pretty heavily. Common themes I noticed were – stuff that can fly, music for the friend, fluffiness, and yummy snacks. I mostly used these ideas in my second prototype, the distraction method. I integrated activities that had these properties.

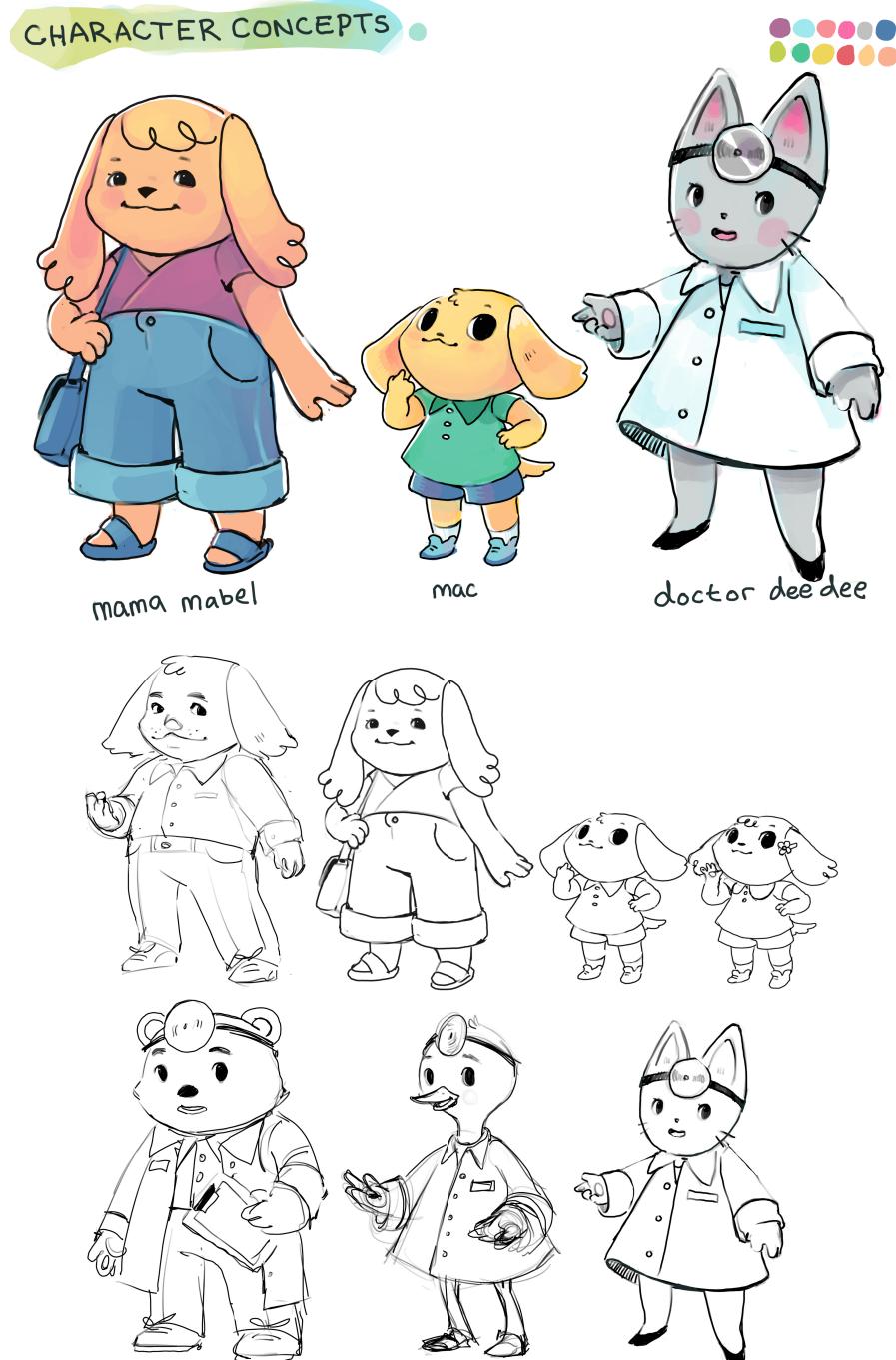
After I had designed the prototypes within my design criteria, I directly asked for verbal feedback from the primary stakeholder, Dr. Sears, on each one. I gave her a small presentation on each of the prototypes, the character designs, and what criteria I was trying to meet. I also asked for a patient's feedback on the character designs. Feedback and changes that were made are elaborated in each section.

### **Discarded Ideas**

For my previous part of my project, I considered a virtual reality solution as a format. This is still something I might consider for older children, but I decided I would focus on my original target age group for both of my prototypes. The VR headsets also have a lot of setup hurdles and would not proliferate well in smaller practices, so I decided not to pursue it for now. Other discarded features are noted in the individual prototype notes.

### **Character designs for prototypes**

In my current design iteration, I am using the following characters to demonstrate my prototype. Within the final product, there will likely be options for a father, a girl twin of Mac, and different options for doctor appearances.



I chose to make animal-based characters, instead of human-based, because I think seeing a pet or more mascot-like character would be more comforting to a child. Human-based characters are also more difficult to make appealing to a wide audience—children like to see their appearances reflected in characters, and character customization on the patients' end would take time from their appointment. I would likely have the choice of a girl or boy twin (Mac or Sara) to insert into the simulation prototype though.

For the final products, all animation would likely be 2D puppet-style animation done in Unity, to preserve a more traditional children's book appearance. If the product becomes expanded to accommodate more practices, then I'd make 3D models with painterly textures to allow quick animation and editing of assets.

If the platform were expanded to multiple types of practices, I'd have to limit the doctor body types to 1 or 2 with only the textures and heads changed, so that animations and clothes can still be easily interchangeable.

### Feedback for characters

**Dr Sears:** Upon first glance, Dr. Sears did not like that the doctor was an abnormal color (originally Dr. Deedee was blue), and also thought that the doctor should at least be as tall as the mom. These changes have been reflected in the new design. I made the doctor gray and slightly taller. She also said that multiple character choices would be desirable, so I made a few more sketches of different doctors. She laughed at the duck doctor concept since he was a "quack," which was an unintentional pun on my end.

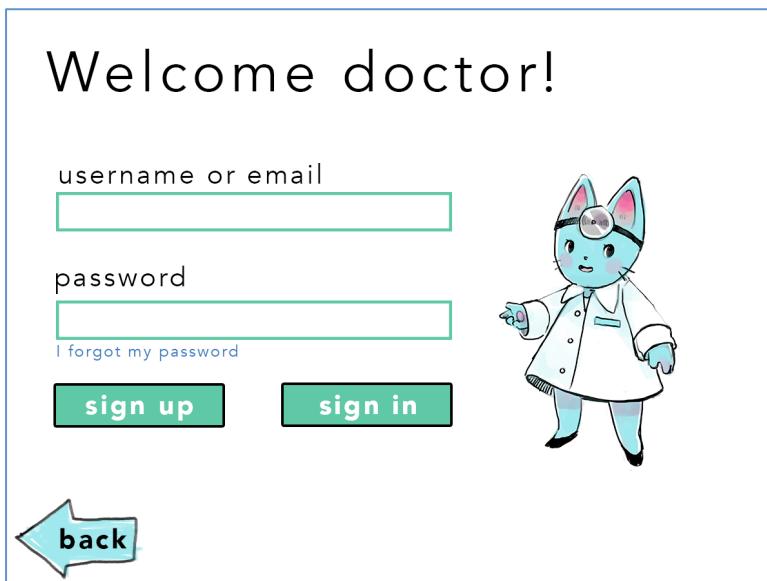
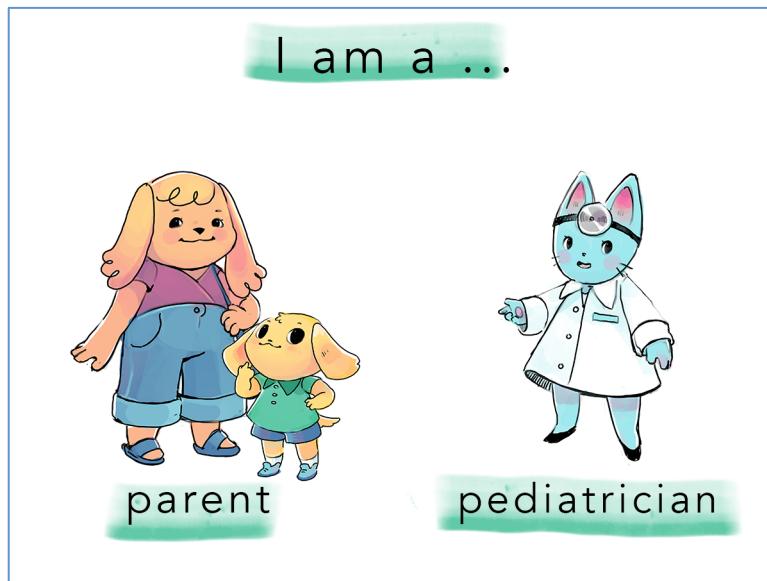
**Patient:** I didn't get to do another full design session, due to the small amount of time children are in the waiting room. I asked a five-year old patient for feedback before a visit and she liked the designs a lot. Her favorite designs were the duck and the cat doctor. She especially liked the colors, and she said that overall, the designs made her feel happy.

### Prototype 1: Pre-treatment simulation

My first prototype is a platform to quickly create customized pre-treatment simulations of vaccines for different practices. This would be a website / mobile app for parents with their young children, and doctors.

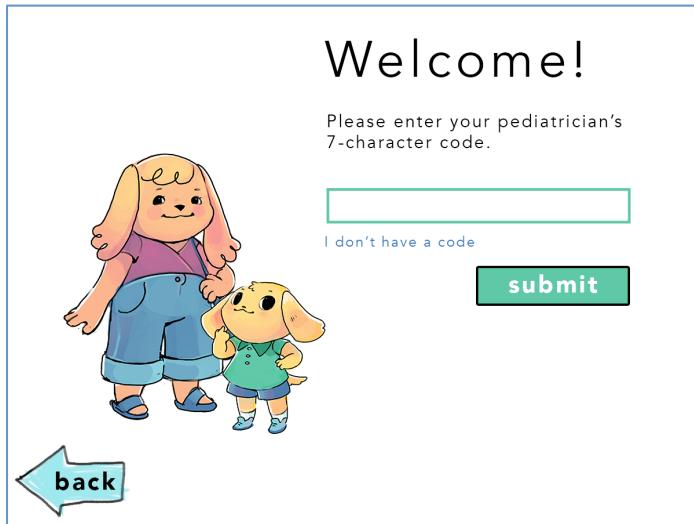
In its basic state, it would educate on why vaccines are helpful in an age-friendly way, and help children feel less nervous about the process. Further expansions would accommodate more types of practices, like for a child visiting the hospital for the first time and getting an MRI, or going to the dentist for braces.

**Scenario:**



- To access the customization portion of the website, doctors would have to log in or sign up. They will be given a customizable code (for the mobile app) or direct link that they can post directly on their website for patients to access.

- Upon signing up, doctors would fill out a questionnaire to customize the basic info that is presented to patients, such as the name of the practice, a picture of the room, a photo of the doctor, and how they conduct vaccines. Upon expansion, this would include a checklist of different procedures they would like to make simulations for.



- Parents and children can access a pediatrician's pre-treatment simulation by clicking through direct website link or by entering a custom code into the mobile app. If they don't have a code, they can view the basic website that has non-customized versions of treatment simulations.
- When the parent follows a doctor's URL, there will be a welcome page that explains that this is a children's book platform that simulates different types of procedures in a child-friendly way. There may be a drop-down selection for what type of visit their child is having. This is if the practice accommodates multiple types of procedures, such as a hospital that would have surgeries and MRIs.
- Then, there would be a brief screen asking the parent to read the information and story with their child, and to press the arrows to go to the next page.
- There may be a question asking to select a parent and a child to go in the story—the options would be a mom or a dad, and one of a pair of twins, a boy or a girl. The default currently is Mama Mabel and her son, Mac. There may also be a question to insert the child's first name.
- In the first part, Dr. Deedee would introduce herself. "Hi, I'm Dr. Deedee! Welcome to (office name), (child's name)! Let me take you on a little tour."

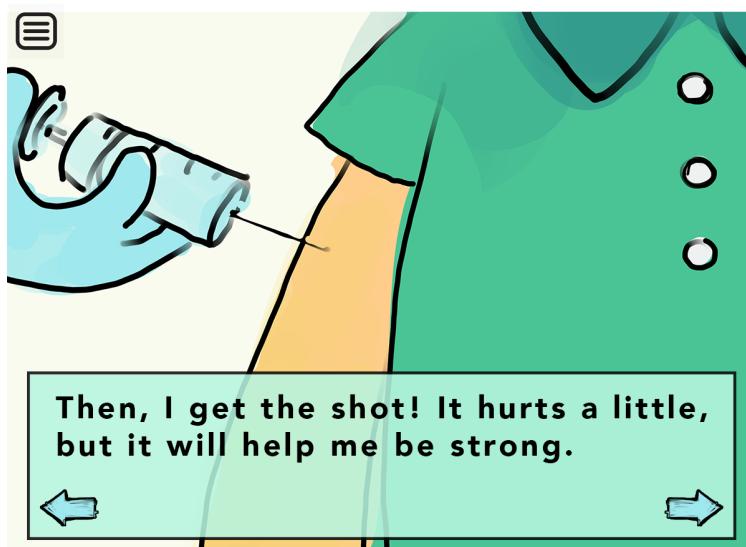
- "I am helping out Dr. \_\_\_\_\_ today! This is your \_\_\_\_\_ (Doctor, dentist, etc). (Screen showing doctor)
- A few fun facts about the doctor, to humanize them and make them less scary—"Dr. Sears loves gardening and baking! Her favorite animal is an octopus. She likes to collect teacups!"
- Screens of office, etc: "This is what her office looks like!" "Here is the waiting room, there are lots of toys and books to read while you wait!" "This is where you will see Dr. Sears!"



In the second part, there would be the procedure simulation.

- Deedee would introduce Mac, or his twin sister.
- "I heard you were going to get a shot soon, (patient name)! Mac here is also about to get a shot too. Shots can hurt a little, but they make us strong against feeling sick!"
- Hi, I'm Mac! I'm going to get a shot today! Shots used to make me scared, but now I know that they can protect me from scarier sicknesses. Let me show you.
- ((Depending on if the doctor selects arm or leg administration during the questionnaire, this will be different)

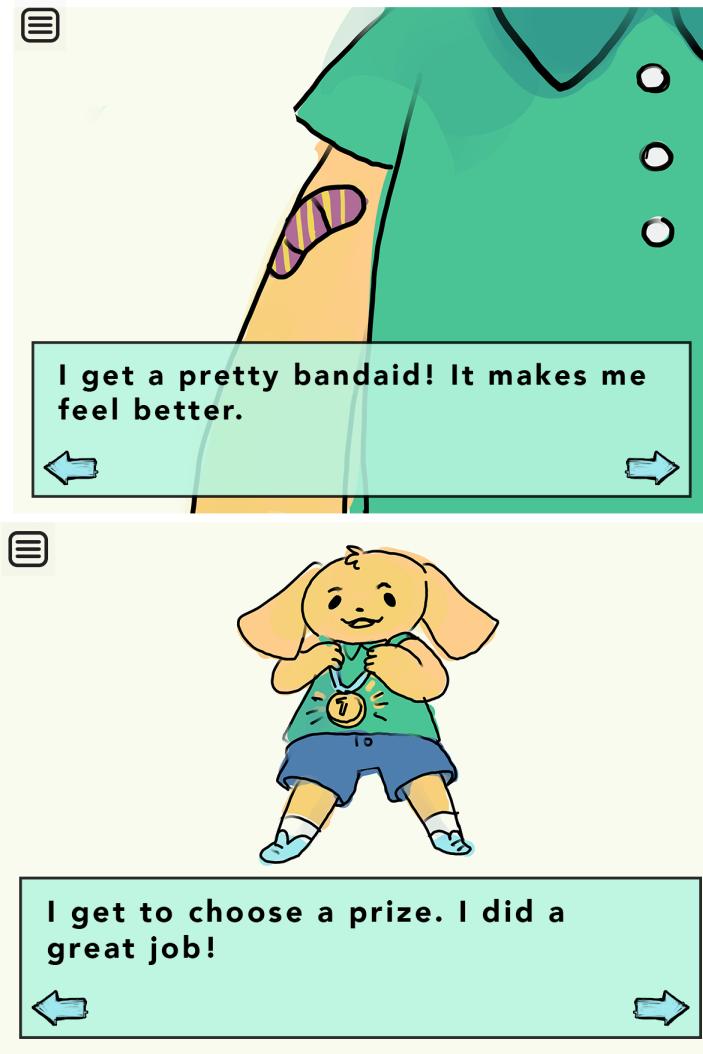
- "First, I sit up on this table."
- "Then, Dr. Deedee takes my temperature."
- "Dr. Deedee cleans my arm. It feels a bit cold!"
- (Any other slides for process)



- "The shot tells my body how to beat bad sicknesses! It's like getting a new superpower. (visualization of what shot defeating bad guys)



- "It only took a second! It was over faster than I thought. I stayed calm and still, so it was easy!"



- "We say thank you to Dr. Deedee! Mama and I are going to get lunch."
- Dr. Deedee comes back- "Mac did a great job, I'm sure you can too, (Patient name)! We'll see you at (office name) soon!"

### Other features

If possible, character text would be partially voice-acted to enable children to have less reliance on their parents' reading, and to give the characters more life. This would have to be worked around customized components, however.

Further expansions would include more customization options—When a doctor signs up, they could change the appearance of the doctor character to a different animal or color, and select the type of practice they have and what simulations they would need

to create. If multiple simulations are needed (like a hospital would need different procedures), their single link would cover all of them.

I previously considered the possibility of fully customizable text and full GUI as an option, but Dr. Sears said that doctors would have very little time to customize it much further than the fill-in-the-blank customization. A better route would just to have open feedback available for doctors, so they can recommend features that they'd like customizable, or new simulations they'd like.

The main downside of customizable text is that voice acting can't be prepared for the characters beforehand—parents would have to read aloud for the children. Perhaps only simple greetings could be voice acted, like "Hi there!" and "See you soon!"

## Feedback

Dr. Sears thought that this design met all of the design criteria. She also said that expanding this to different types of practices would be very marketable! She noted that doctors don't have any spare time, so a GUI interface would not get much use—pretty much all customization should be done in the beginning through the questionnaire and through options. She said that she could definitely see this getting use in emergency room waiting areas, because people wait for hours there and children get very anxious. She said that hand-held tablets are often used for checking in at hospitals, so the transition to use would be fairly natural there.

The primary advantages I see with this application is that custom pre-treatment simulations have been shown to work on an individual-case basis before, but are not currently available to general practices. This would be very quick to set up on the doctor's end, and easy to access for a patient on the doctor's website through a simple hyperlink.

One limitation I see is that I am not a children's book writer—I am not experienced in writing for children. I would likely have to consult a writer for additional feedback on the script, and for how to make the experiences more engaging. I'm also not sure of the most effective analogies to use when explaining vaccines to children.

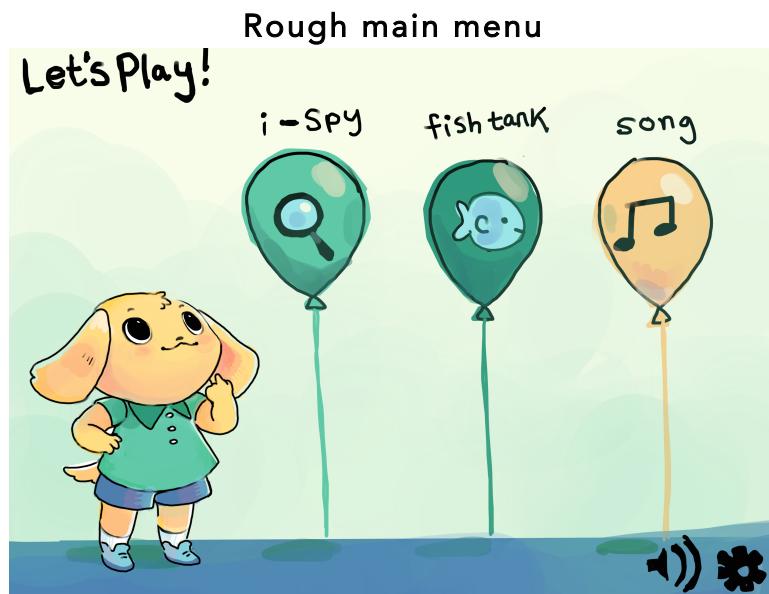
If this application expands to multiple types of practices and simulations, I would need a lot of additional feedback from practitioners. I would need to research how these procedures are conducted, and how to best explain them to children.

## Prototype 2: During-vaccine distraction

This would be a simple distraction app that a pediatrician or parent could set up on a phone or tablet. All activities are designed to be hands and motion-free to allow the pediatrician to administer the vaccine. This is where I used inspiration from my design session with children.

### Scenario

- A young patient is about to get a shot, and is visibly distressed. Dr. Sears pulls down the iPad with the swivel wall mount. She asks if the patient would like to play i-Spy, see some fish, or sing "The Wheels on the Bus."



- When user taps an option, Mac grabs the balloon and flies up into next screen.
- Dr. Sears sets up the iPad on the wall mount so that the patient must lie down to view it.
- Future features: second screen for each option, to select a game activity, zen / calm activity, or a song.

- At the beginning of each activity there is a very brief verbal prompt: "Let's play I-Spy!" "Let's sing a song!" "Let's look at the fish!"

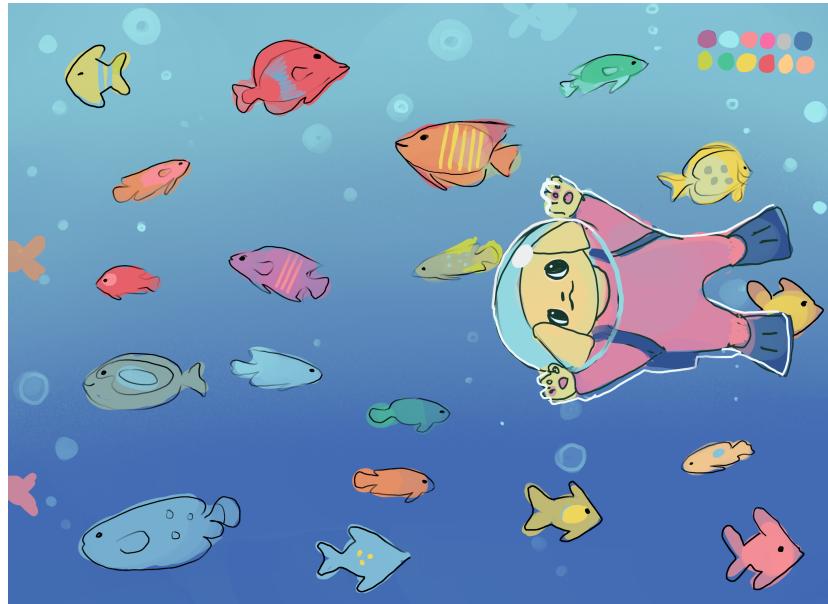
### Quick hands-free game



- I-Spy – mentioned in the interviews as a favorite game, and I often see parents playing with their kids in the waiting room. This would just be a projection of many icon images and would require parents to direct the experience.

I considered voice responsiveness, but children aren't very good at articulating words in this age group—this would cause a lot of frustration. Tapping interactivity with verbal prompts might be an option for older children who can move one arm during vaccines.

### Calming activity



- The second option is a calming / fish tank option. A lot of the children who have been in the practice for a while ask me where the fish tank went—it was their favorite thing in the waiting room. With this, it can make a little return!

The fish would be animated, and Mac the dog will swim across the screen sometimes in different diving gear. There would a toggle for a calming song to play as well.

### Sing-along Song

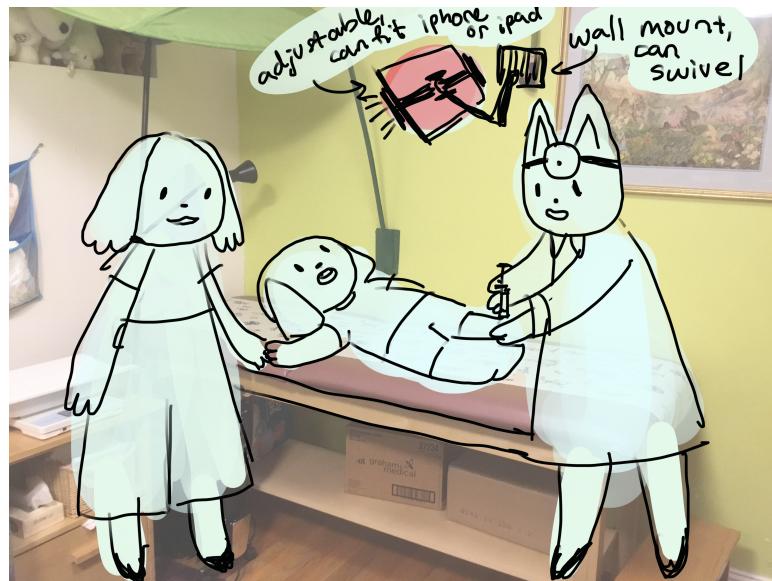


- I like "The Wheels on the Bus" since it encourages participation, though there are a lot of other possible options. This section would have a simply animated video kind of like those creepy nursery rhyme videos on Youtube, but not creepy.

### Physical format

In the context of my mom's practice, she administers vaccines on the leg for young children. This makes it difficult for parents to use normal distraction methods since the child is on their back. According to my mom, having the child stay on their back is the most difficult part, so having a system where they can only see the distraction while lying down would entice them to stay in position.

A swiveling wall mount might be ideal to show the activity, much like how dentist offices have TVs. It would allow the doctor to tap through the app or fold it against the wall without removing the tablet. The adjustable holder might also allow parents to place their own phones in the holder if preferred, though I'll have to look into whether they make adjustable holders that accommodate both small tablets and phones. We have a few old spare tablets around the office, so this would be an approachable UI option.



However, I worry that the physical-ness of the tablet and wall mount would become a distraction for children in an unintended way (since its relatively close, a child might grab it or fiddle with it during other types of visits).

As such, an inexpensive Cube projector might be a better option. This would connect to my mom's phone screen, so she or a parent has access to the controls at all times. I'm not sure where the ideal placement would be—I'd have to test this.



I discarded this idea and opted for the mounted iPad, as elaborated on in Dr.Sears' feedback.

Since this is a customized solution specific to my mom's practice, I have a little more leeway for presentation options. Other practices typically administer on the arm for this age group, so ceiling view-ability isn't as crucial. For arm administration, a parent holding the phone or tablet will work fine.

## Feedback

Dr. Sears thought that the activities would be effective distraction methods, and that they met the design criteria. She said that the projector would be too much hassle to deal with, and that placement would be an issue. She liked the wall swivel mount a lot better for UI approachability, and that it could be a constant fixture within the office space so no very little setup would be required. She said that the mount could swivel upwards so that the iPad would be out of reach for children, but still reachable for adults. A Velcro clasp could secure it to the wall when not in use and to prevent the iPad from being pulled down.

The primary advantages I see with this application is that it will be effective for my mom's practice, since it can be viewed while the child is lying down. It will provide an incentive for children to look up, and even the weirdness of having a fun screen above them might make children stop being as nervous.

One thing I am concerned about is the view-ability of some activities that may require parental participation, such as i-Spy, so this activity might be left out of the final design and replaced with another song or zen activity. If there are other practices that use leg administration, the wall swivel mount would not be an obvious solution to them—another issue. I will have to see how common leg administration is, and if I'll need to provide some sort of note within the application.

### **Requirements changes**

I did not modify my original design criteria much, though these designs would likely get many changes after actual testing and use. I did add separate criteria to accommodate for the pre-treatment simulation, which I was not heavily considering during my project part 1 stage.

Overall, the main hurdle in my requirements is that these applications will require a lot of time to produce, since art assets take time to make and animate. Since I am an artist for children's games, this isn't any different than what I usually do, though. I also have experience making my own games in Unity, so I can create these applications without hiring additional help—unless the platform expands to accommodate many different features.