Designing and developing an efficient way to use PAM Aerosol Cooking Spray

Yahav Manor

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Project overview

The product: EasySpray

An efficient way for our user with cerebral palsy to effectively spray PAM cooking spray on a baking pan.

Project duration:

March 2023 - May 2023

Project overview

The problem:

Natalie is a user with cerebral palsy who struggles with hand motions, grip strength, and fine motor skills, which causes her hand to fatigue when pressing and gripping.

The goal:

Our design must involve an accessible way to hold and press down on the PAM cooking spray in order to uniformly grease the baking pan.

Project overview

My role:

UX researcher and product designer

Responsibilities:

User research, interviewing, low and high fidelity prototyping, user testing, manual creation

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Understanding the user

- Persona
- User research
- Cognitive task analysis
- Current market research

Natalie Fierce

Family: lives across the hall from her parent's apartment
Interests: basketball, Disney
Occupation: YouTuber
Channel: https://www.youtube.com/c/nataliefiercehascerebralpalsy

Goals

- Bake a cake in the most 'standard' way she possibly can
- Spray the PAM cooking spray around the baking pan in an efficient manner to make baking process easier
- Find a solution that fits her specific needs and account for her grip/hand movement limitations and capabilities

Frustrations

- Nozzle for PAM cooking spray is extremely small
- Her grip cannot hold for very long in an extended finger position
- Usually has to call on help to efficiently use spray
- Can only use one hand efficiently

User research: summary

We conducted an interview with Natalie and her mother Patti to better understand her struggles and note precisely her capabilities/limitation regarding hand grip and wrist movement. We also conducted secondary research by watching a variety of her YouTube videos and specific videos she created for us to analyze and interpret design requirements.

User research: interview note taking

Class 19 Activity
Notes from discussion with Natalie and Patti

Lifestyle
- Live together, two apartments that are joined together
- Niece named Annie (5 years old), helps her out with stuff

Task analysis of 3 ingredient cake
- Creating a non-stick coating
  - Patti uses the Pam
  - Get it out of the cupboard
  - Can't spray the Pam can
  - Barrier
  - Could use a stick of butter and smear it around the pan independently
  - Pam can is used by the other baker on YouTube
    - Likes this YouTuber because she is energetic and fun, very personable and sweet
    - Goes down into each step when it comes to baking from scratch
    - https://www.youtube.com/@BeautifulTooCreationsWithDonna
  - Can Natalie make it, not necessarily can Natalie do it all by herself?
  - How do you make sure the non-stick is evenly distributed?
    - Do not try to make it evenly spread
    - Spray it in the center, use the paper towel to spread it around

Devices and kitchen aspects
- Have trays with dividers in it
- Make cookies as if they are brownies
- Two high low tables that can separate from each other
- Can have adjustable height
- Can clamp things to the table
- Clip on clamp
- Cut out underneath stove top so that wheelchair can slide under
- Sink has the same cut out

Anthropometrics and biomechanics
- Natalie has optic nerve atrophy
- Pointer finger on the right hand can move really easily
- Right hand can go up and fully extend arm
- Left hand is pretty much completely unusable
- Is Natalie involved in taking tools out of the drawers?
  - Patti says Natalie is able to take tools out though she chooses not to
- Turning wrist horizontally is much harder than vertically
- Wrist naturally deflects into a side position to gain maximum strength
- Pretty good grip in her right hand
- Hard to turn into a bowl to reach into something
- Can push the bowl and turn it around
- How easy is it to adjust the position of the wheelchair?
  - Joystick has a screen
  - Uses just her pointer finger to move the joystick for the chair
  - Wheelchair goes above one foot high
- Edge 2.0 wheelchair
- Prefers things with a handle for simpler grip
  - Preferes 90° handles instead of a straight handle

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User research: videos

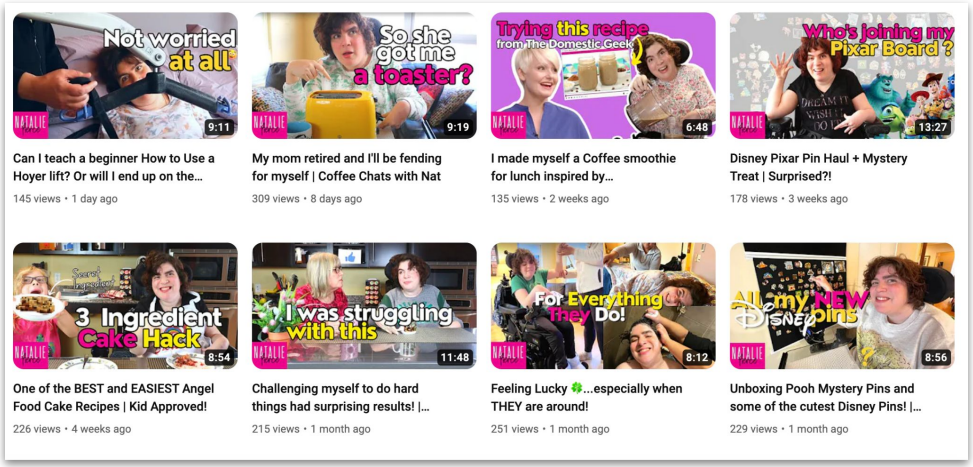
Videos used for further analysis and reference:

[One of the BEST and EASIEST Angel Food Cake Recipes]

[I Baked Like the Pound Cake Queen on National Pound Cake Day!]

[Baking A Subscribers 3 Ingredient Cake!]

[QUESTIONS ABOUT CEREBRAL PALSY ? GET TO KNOW ME AND MY WHEELCHAIR]



User research: pain points

Intense and prolonged grip strength

Finger extension

Source: https://www.webstaurantstore.com/pam-17-oz-high-heat-baking-release-spray/999PAM07264.html

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User research: pain points

1

Accuracy

Struggles with aiming the spray to hit the pan and not fly into the air/get onto surrounding products. Finger tends to cover small hole and prevents spray from emitting.

2

Efficiency

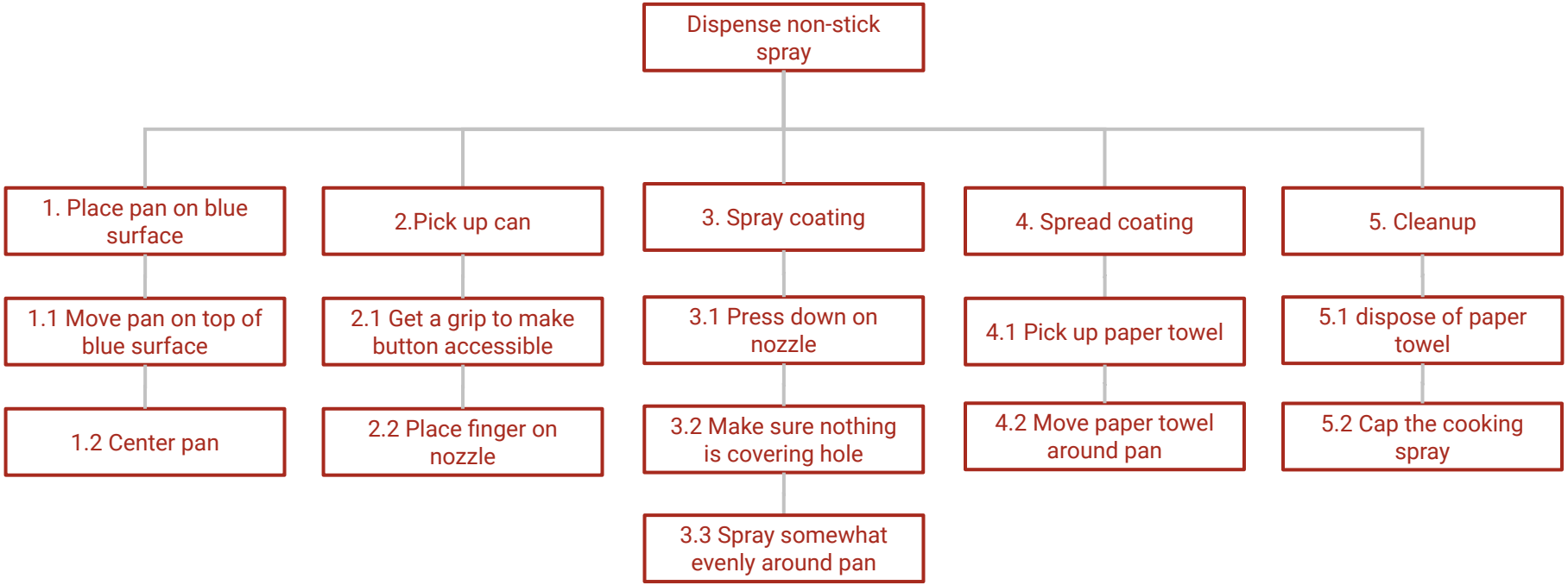
When using the spray, our user has a hard time making sure that it covers the surface of the baking pan evenly; as a result, there is frequent clumping/parts that are completely uncovered.

2

Accessibility

Our user has not been able to find a product that increases the accessibility of the PAM spray in a way that fits her needs regarding hand/wrist movement and grip.

Behavioral task analysis



Current market research

The trigger handle converter allows any aerosol container actuation system to be converted to a squeeze motion, making it more accessible to Natalie's strengths.

The white butter application device makes it easy to apply butter to a piece of corn, this could be a similar application!

This olive oil spray dispenser has a larger, more accessible trigger, which could enable easier grasping.

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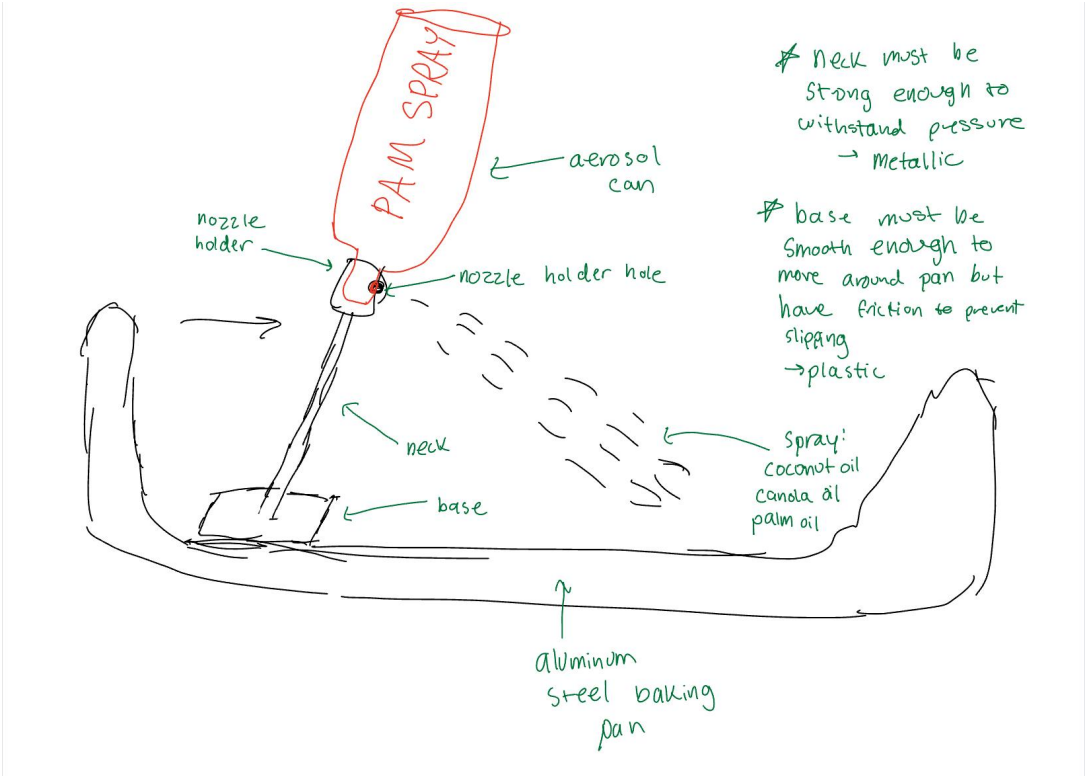
Starting the design

- Low-fidelity prototype drawings
- Low-fidelity prototype
- High-fidelity prototype development
- User testing

Low-fidelity prototype drawing

- Reduces the necessary finger extension and uncomfortable grip of the original PAM spray by maximizing use of the entire arm's strength and the weight of the can
- Nozzle holder securely locks the nozzle into place when applying pressure
- Neck creates a sufficient distance between the output of the spray and the pan itself to avoid clumping
- Base provides support



Low-fidelity prototype

- Conveys where the nozzle will be placed as well as where the hole will be facing.
- The popsicle stick conveys the part of the product that produces an angle, which allows the PAM spray to be sprayed in a direction that directly hits the pan instead of out into the open.
- The foam paper at the bottom depicts the part of the product that will provide support for the user.

- Foam paper
- Popsicle sticks
- Duct tape
- Hot glue

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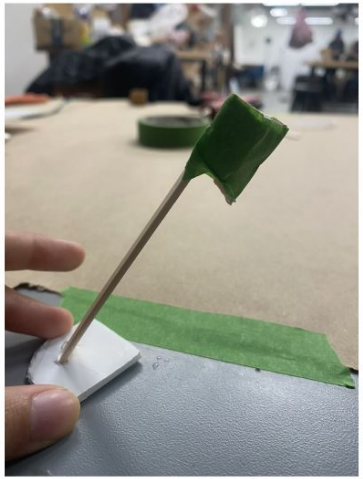
Low-fidelity prototype

The prototype does not convey the following:

- Exact measurements
- An actual hole for the spray to come out of
- Bottom part of the green portion that would push down on the top of the nozzle to emit the spray
- A potential deflector that would encourage the spray to move onto the baking pan and not into the open air
- The intended materials



- Foam paper
- Popsicle sticks
- Duct tape
- Hot glue

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High-fidelity prototype development

Used the vertical band saw to cut out shape of base
Base made out of Teflon (food-safe)

Used the sanding wheel to smooth rough edges made on the base

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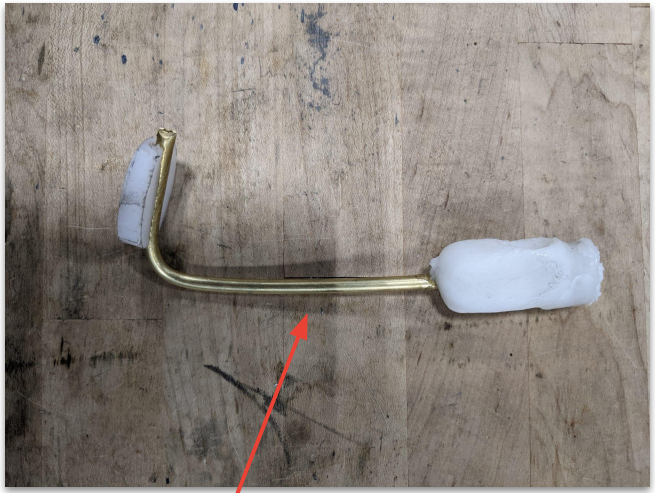
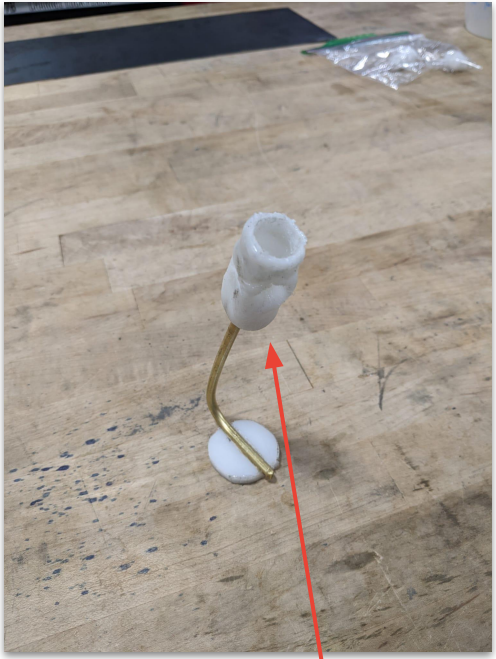
High-fidelity prototype development



Manually bent a piece of brass and used Zap-A-Gap to attach pieces



Melted polymorph plastic pellets and molded to exact nozzle shape of the PAM spray

User testing: findings

Watch video:
Red nozzle frequently slips off of the nozzle

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Refining the design

- Final prototype
- Prototype video
- Instruction for Natalie
- User testing plan for Natalie

Final prototype

Extended nozzle holder further into the can in order to provide more stability when applying pressure to the device during use
→ melted more polymorph plastic pellets and used a sanding gun to smooth surface before gluing onto main device

- Brass pole
- Polymorph plastic
- Teflon
- Zap-A-Gap

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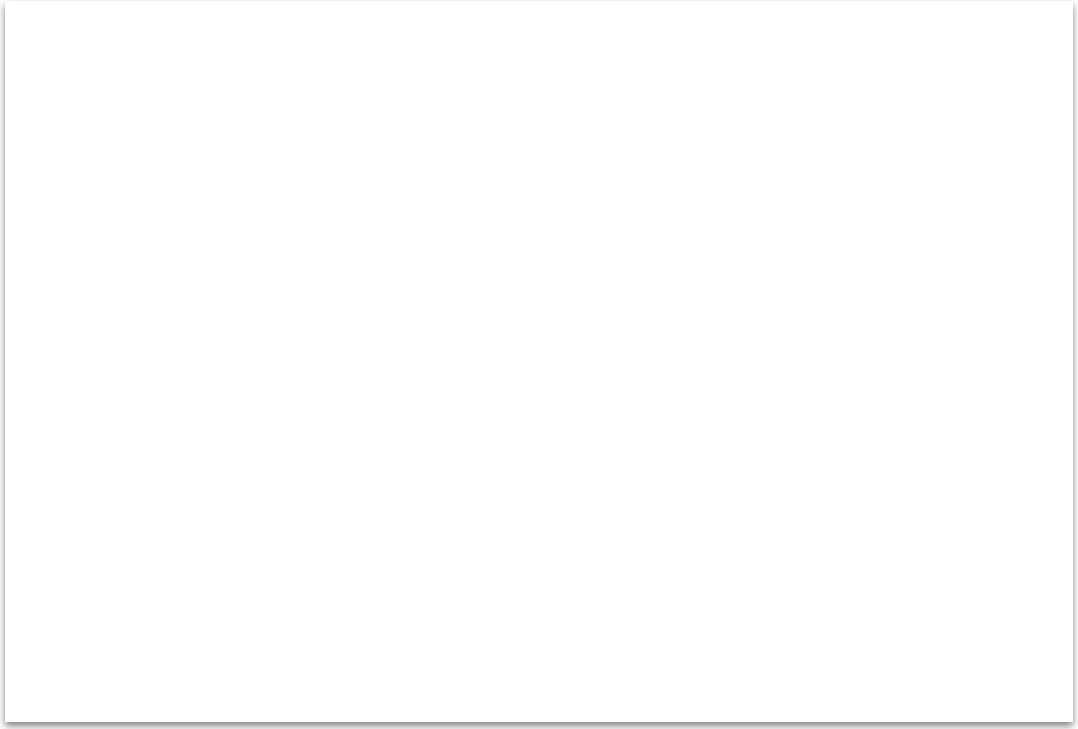
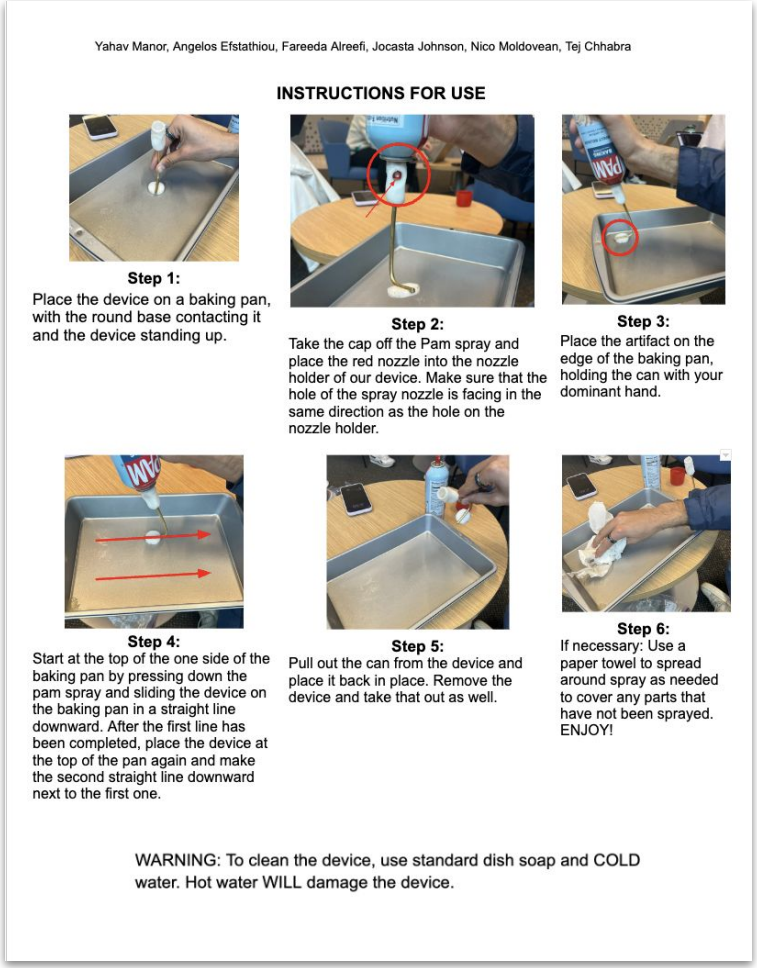
Prototype video



Instructions for Natalie

As a part of our deliverables to Natalie, we prepared a manual for her and her mother to use when using EasySpray. The instructions detail exactly how to maximize efficiency of our product and what to do if the spray is not evenly spread around the baking pan surface.

Access this document here: https://docs.google.com/document/d/1sLj6mzezVBQ04qWhf-XWzAynh09D-NeH7-8BH6KmLbo/edit?usp=sharing



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INSTRUCTIONS FOR USE

Step 1:
Place the device on a baking pan, with the round base contacting it and the device standing up.

Step 2:
Take the cap off the Pam spray and place the red nozzle into the nozzle holder of our device. Make sure that the hole of the spray nozzle is facing in the same direction as the hole on the nozzle holder.

Step 3:
Place the artifact on the edge of the baking pan, holding the can with your dominant hand.

Step 4:
Start at the top of the one side of the baking pan by pressing down the pam spray and sliding the device on the baking pan in a straight line downward. After the first line has been completed, place the device at the top of the pan again and make the second straight line downward next to the first one.

Step 5:
Pull out the can from the device and place it back in place. Remove the device and take that out as well.

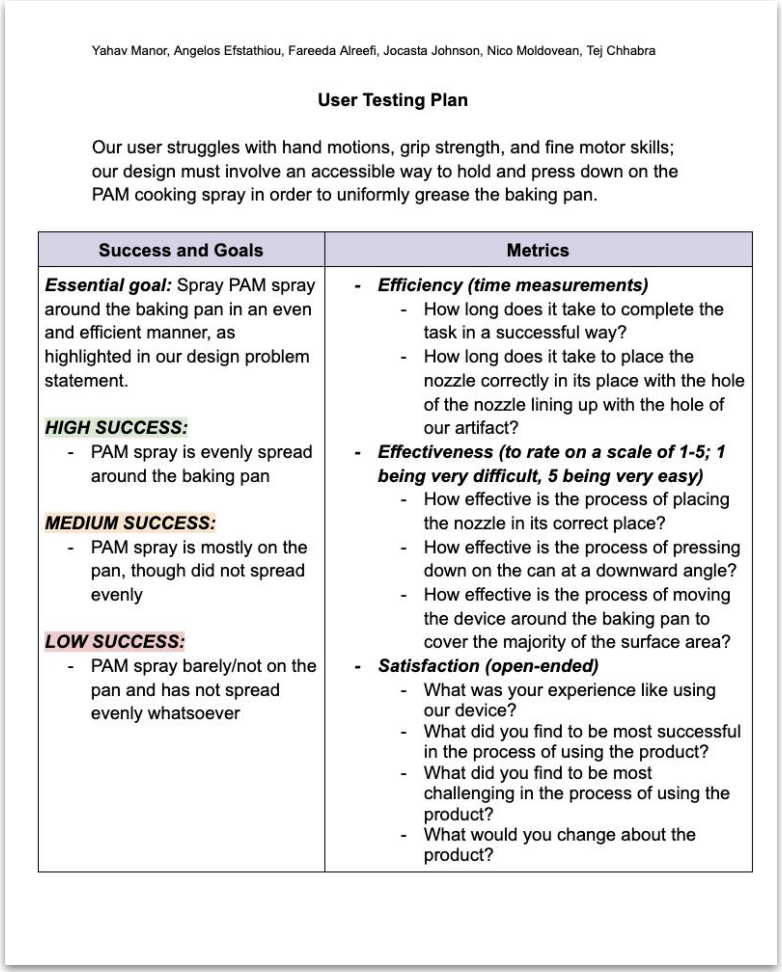
Step 6:
If necessary: Use a paper towel to spread around spray as needed to cover any parts that have not been sprayed. ENJOY!

WARNING: To clean the device, use standard dish soap and COLD water. Hot water WILL damage the device.

User testing plan for Natalie

As a part of our deliverables to Natalie, we prepared a user testing plan for her to reference when using our device. The document details our design problem statement, definitions of success, and metrics for usability including efficiency, effectiveness, and satisfaction.

Access this document here: https://docs.google.com/document/d/1Xz_nhA4OpgN7SWbjia1PClr9e0J0x8OAzqwE2nSg7ng/edit?usp=sharing



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User Testing Plan

Our user struggles with hand motions, grip strength, and fine motor skills; our design must involve an accessible way to hold and press down on the PAM cooking spray in order to uniformly grease the baking pan.

Success and Goals	Metrics

Essential goal: Spray PAM spray around the baking pan in an even and efficient manner, as highlighted in our design problem statement.
 	
HIGH SUCCESS:
- PAM spray is evenly spread around the baking pan
 	
MEDIUM SUCCESS:
- PAM spray is mostly on the pan, though did not spread evenly
 	
LOW SUCCESS:
- PAM spray barely/not on the pan and has not spread evenly whatsoever
	- ***Efficiency (time measurements)***
	  - How long does it take to complete the task in a successful way?
	  - How long does it take to place the nozzle correctly in its place with the hole of the nozzle lining up with the hole of our artifact?
	- ***Effectiveness (to rate on a scale of 1-5; 1 being very difficult, 5 being very easy)***
	  - How effective is the process of placing the nozzle in its correct place?
	  - How effective is the process of pressing down on the can at a downward angle?
	  - How effective is the process of moving the device around the baking pan to cover the majority of the surface area?
	- ***Satisfaction (open-ended)***
	  - What was your experience like using our device?
	  - What did you find to be most successful in the process of using the product?
	  - What did you find to be most challenging in the process of using the product?
	  - What would you change about the product?

Going forward

- Takeaways
- Next steps
- Let’s connect

Takeaways

Impact:

Throughout the process of completing this project, we have gained an understanding of the importance of proper user research. All of the information we used to make design decisions were based in data we gathered from watching Natalie's video and interviewing her. We could not have made this product so ideal for her physical limitations without her active participation.

What I learned:

It is important to highlight that I learned a lot about user research, as mentioned previously. Though, I also learned a lot about working on a team to design a physical product (as opposed to an interface) by utilizing different group members' strengths.

Next steps

1

Receive feedback from Natalie and Patti and make necessary adjustments based on feedback. Potentially add a second component to the base to provide greater stability and increase the product's lifetime. Also, we want to improve the aesthetics, as they were not a part of the design process of this assignment.

2

Expand the target audience of the product, potentially opening up to other users with cerebral palsy or other physical disabilities

3

Review current accessibility standards and guidelines for food-safe products made for people with disabilities and certify our product's compliance.

Let’s connect!

Thank you for your time in reviewing the EasySpray product! I’d love to get in touch to address any comments, questions, or concerns:

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