

# Power (=Torque\*Speed) to the People

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# Background

My grandmother, along with a large proportion of older adults, experience varying degrees of arthritis. In my grandmothers case, due to her working long hours for some 60 long years has left her fingers bent and crippled. Yet she is still full of life and loves to do many of the activities she enjoyed when she was younger. Among these activities is cooking. My grandmother loves to cook, but because of the severity of her arthritis she is unable to open jars and cartons to use milk, juice, sauce, and other cooking ingredients.



# Problem

- Those like my grandmother with severe arthritis are unable to open lids and thus cannot enjoy the activity of cooking without the aid of another person.
- According to the CDC, approximately 49.7% of adults 65 years or older reported an arthritis diagnosis.
- Specifically, an estimated 1.5 million adults had rheumatoid arthritis in 2007.

# Design Criteria

The device must:

- Be able to be operated by my grandmother and others with severe arthritis by themselves.
- Be able to be used on lids of various sizes, such as pasta sauce lids and milk carton lids
- Provide a way to open even the most difficult of lids without forcing the user to exert any more force than normal
- Be small, portable, and inexpensive to be able to be used in different kitchens/areas.

# Research

One of my goals in pursuing this project was to create a tool that would not only benefit my grandmother but also those with less severe forms of arthritis. In order to get a better idea of how to achieve this goal, I decided to interview three participants. Each participant is from a different age group and each has a different reliance on a tool to open a lid. The following three case studies are as follows:



# Grandmother

Age : 75

**Occupation:** Spent 60 + years working as a field worker as well as factory worker. Single mother of three. Even after retirement continued raising grandchildren and great grandchildren. Cooks three meals a day seven days a week, especially on holidays.

**Need:** Unable to grasp anything with any real power. Cannot open jars unless already opened (some jars provide trouble even after first opened). Has no problem pushing/pulling.



# Father

Age : 44

**Occupation:** Growing up a child in love of sports, played basketball and baseball into the waning hours of the day. Currently works as an analyst using computer programs to maintain roads and highways. Calls for 8+ hours a day at the computer, has the onset of early stages of arthritis.

**Need:** Can open most lids with relative ease, but can run into trouble on lids made of metal or other slippery materials. Can open these with the use of a jar grip rag (though with the occasional noticeable effort)



# Myself

Age : 22

**Occupation:** Student with years of wear and tear on hands due to diligent note taking. Like many my age, I enjoy playing video games without concern to the damage they inflict on my hands.

**Need:** Though I have no trouble opening most lids (the occasionally difficult lid will pop up) I am sometimes forced to use a jar grip rag. This provides all the assistance I currently need, albeit I can see the waste of energy that using such a device provides.



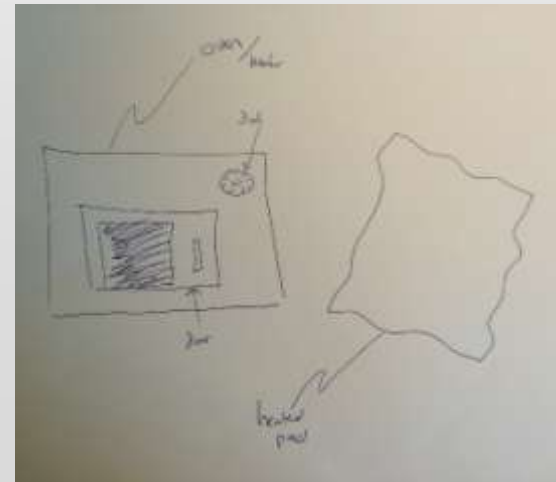
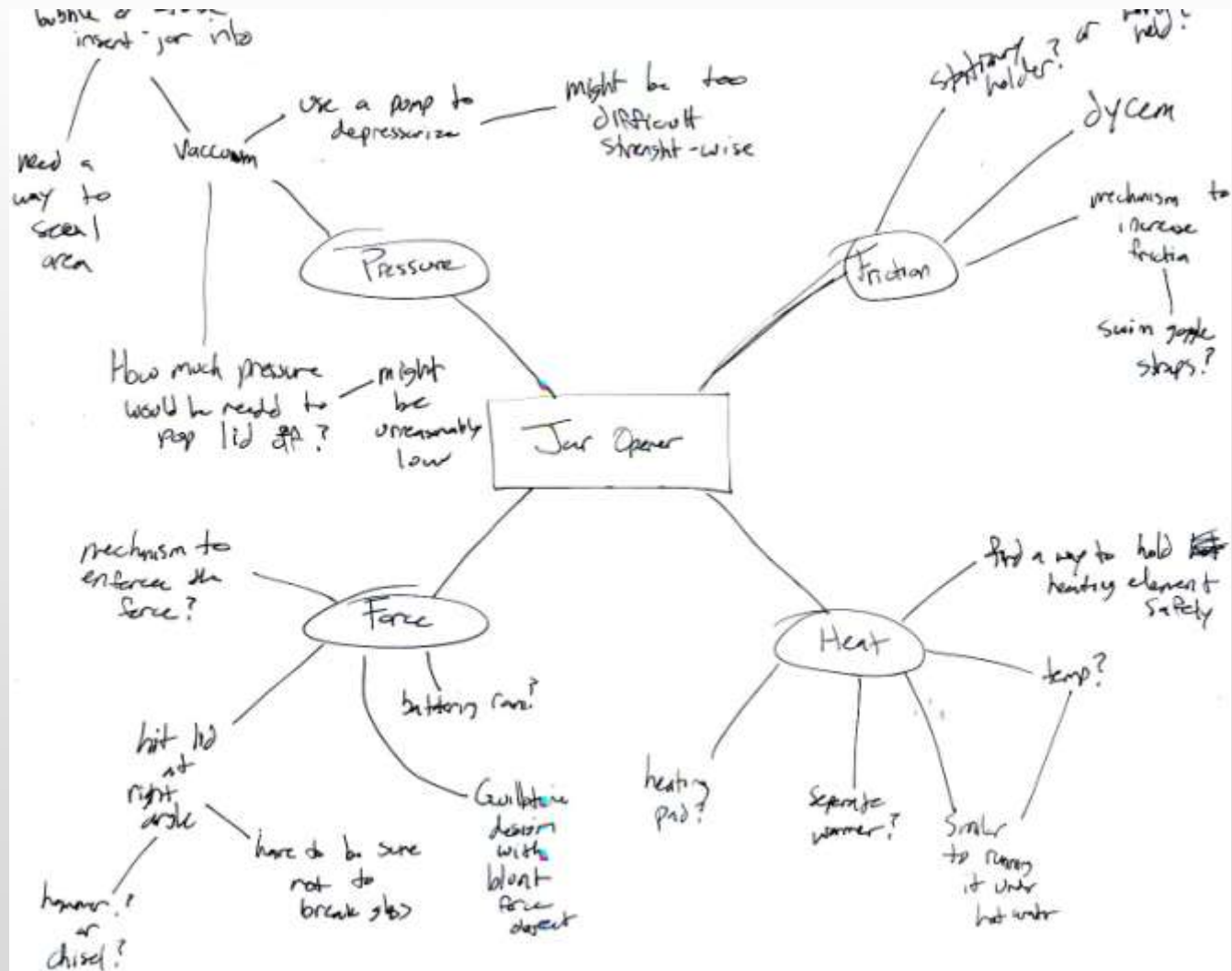
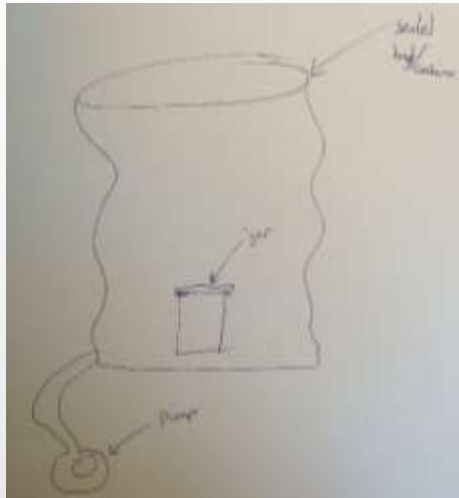
# What's out there now?



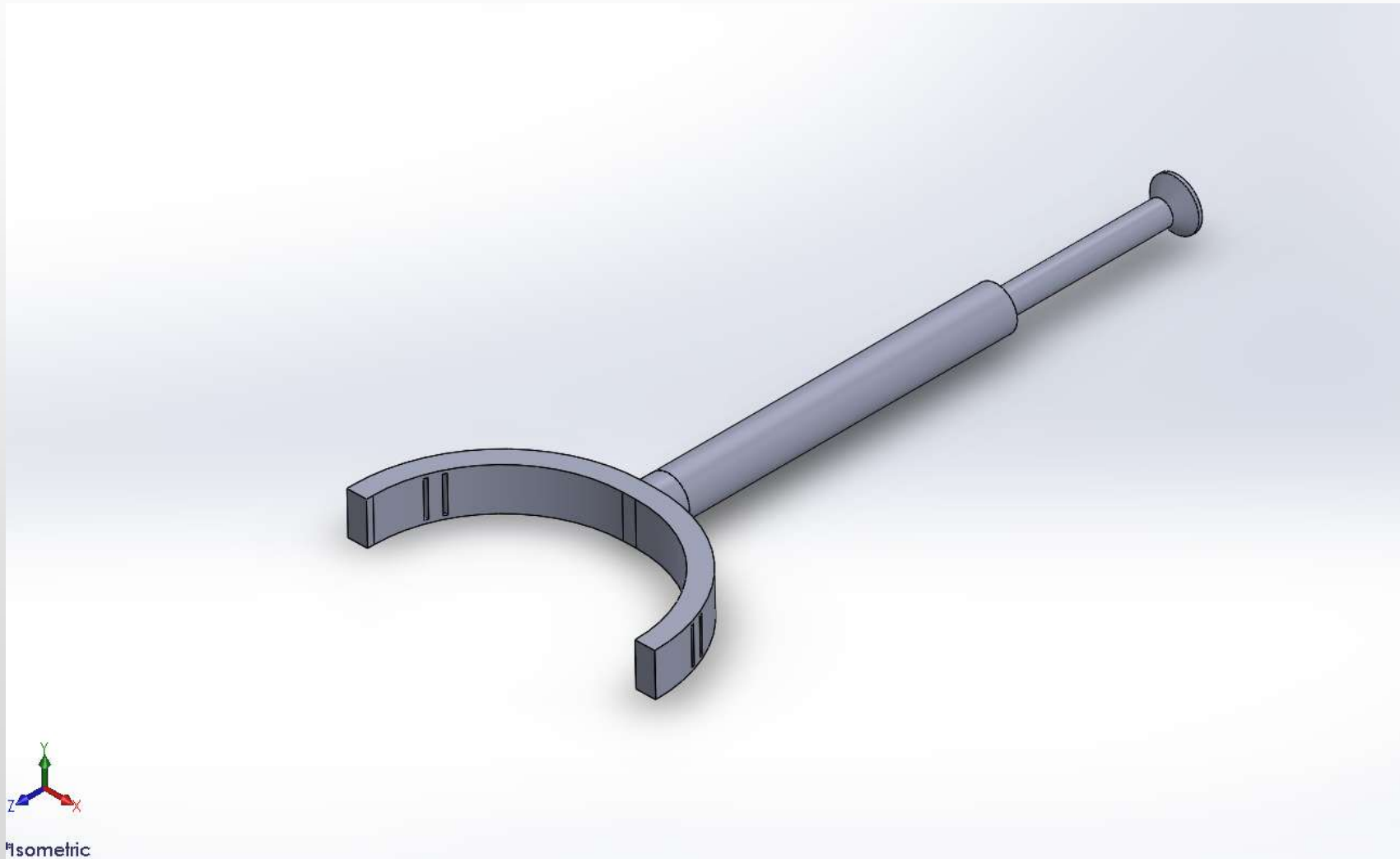
# Why these aren't the answer

- Expensive
- Not adjustable
- Require too much gripping strength
- Difficult to transport
- Require too much force
- Many only usable on certain types of lids

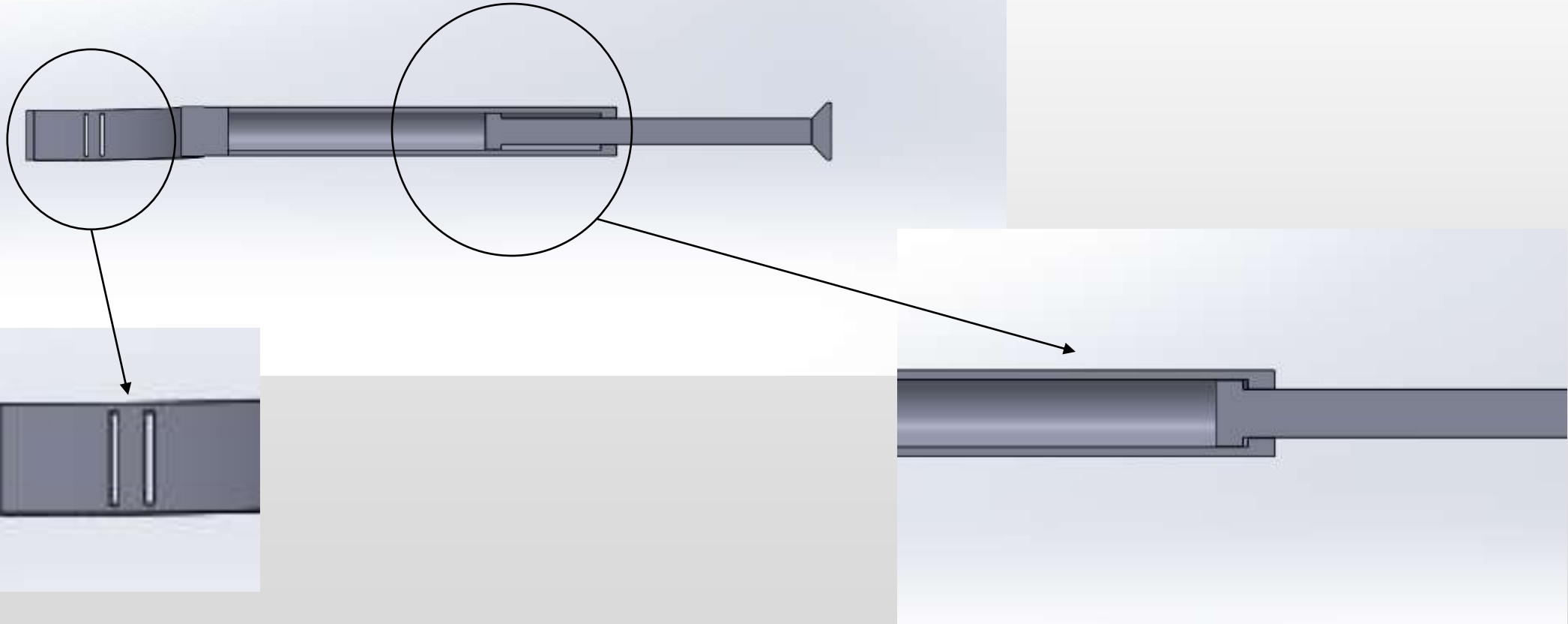
# Brainstorm



# The Chosen One



# Upon Further Inspection





# The Materials

**Technical feasibility** – Using the 3D printer, it will be possible to create the main body of the tool both quickly and rather cheaply. Using plastic instead of metal is the preferred design choice.

**Engineering difficulty**- While the actual fabrication may not be overly difficult, doing the necessary torque and force calculations to ensure the tool works correctly and doesn't bend/break can provide challenges.

**Estimated cost**- Part of the design criteria was to ensure the tool was inexpensive and could be replicated easily. My goal is to keep the cost to under \$30 per tool.

**User acceptance**- My grandmother and others with arthritis were thrilled at the idea of using a tool to continue their passion for cooking unassisted.

**Safety considerations**- Using plastic for the main body and Dycem for the strap ensure the tool is safe and comfortable to use with no risk to the user.

# What's Next?

- With design and testing wrapping up, all that's left is to fabricate and continue iterating.
- Using the 3D printer, I hope to be able to quickly produce models that can instantly be tested and corrected.
- Just from initial testing and prototypes, it appears that the band needs to be strengthened, as well as possibly extending the handle to allow for even greater torque.
- I look forward to the coming weeks in which I hope to have the final product ready and able to be used!